Republic of Armenia: ICT Assessment

15 July 2000 Version

July 2000

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Management Summary

This Assessment has been undertaken at the request of the USAID/Armenia Mission in an effort to examine potential opportunities for USAID engagement in the Information Communications and Technologies (ICTs) arena. Over the past several years USAID/Armenia has been quite active in supporting strategic ICT-related projects that have been considered quite successful (e.g. automation within the Central Bank of Armenia, Customs Wide Area Network, etc.).

This ICT Assessment relies heavily on earlier ICT-related work carried out by USAID/Armenia as well as several external ICT-related assessments. The ICT Assessment seeks to pull many of the emerging threads together, validate and update key components reflected in these studies and activities, and ultimately put forth targeted areas of opportunity for further pursuit by USAID/Armenia in the ICT-related arena.

The ICT Assessment has been built around four key areas: 1) ***Pipes***—an examination of the current state of telecommunications within Armenia, 2) ***Public Sector***—an examination of the Republic of Armenia's position and status with respect to ICTs, with specific focus on *Policy*, 3) ***Private Sector***—an examination of the current the state of the private sector with regards to use and leveraging of ICTs, with focus on opportunities, and 4) ***People***—with a focus on identifying opportunities for leveraging ICTs within the current development portfolio of the USAID/Armenia Mission.

The ICT Assessment has concluded that there are at present several constraints that limit Armenia's broader leveraging of ICTs in support of economic development. These are primarily in the areas of Internet access and legal restraints that do not support leveraging the Internet for advancing in the area of E-Commerce. The Assessment also identified opportunities that hold promise—where efforts could be undertaken that would advance the use of, and even the development of, ICTs within Armenia. A series of recommendations are put forward to the USAID/Armenia Mission for consideration. These are reflected in a separate Appendix.

With regards to exploring opportunities within the Private Sector, this ICT Assessment was carried out concurrent with a Small and Medium Enterprise (SME) assessment undertaken by Price-Waterhouse-Coopers (PWC). USAID/Armenia also sponsored this effort. Coordination during the Assessments helped ensure the two efforts were complementary.

The ICT Assessment also precedes by a week, a visit of the President Kocharian of Armenia to the United States for meetings with the President Clinton and Vice President Gore. During the course of these meetings it is anticipated that there will be discussions on ICT-related issues, and during the course of this Assessment the team prepared materials for this purpose. Without predicting the outcome of this dialog, the potential exists that the recommendations of this ICT Assessment may prove of value to USAID/Armenia in identifying "actionable items" for follow-up commitments.

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Abbreviations and Acronyms

ACCELS	Armenia and American Council for Cooperation in Education and Language Study
ADM	Armenian Dram
AED	Academy for Educational Development
ADA	Armenian Development Agency
ANPP	Armenian Nuclear Power Plant
ArmenTel	Armenian Telephone Company
Arminco	Armenian ISP
BI	Business Incubator
BIT	Bilateral Investment Treaty (U.S. and Armenia)
BLS	Bureau of Labor Statistics (Department of Commerce)
BTA	Basic Telecommunications Agreement (BTA)
CAG	Civil Action Group
CAGR	Compound Annual Growth Rate
CBA	Central Bank of Armenia
CIS	Commonwealth of Independent States
CMM	Capability Maturity Model (Software Engineering Institute)
EBRD	European Bank for Reconstruction and Development
EDA	U.S. Department of Commerce's Economic Development Administration
EIT	Economies in Transition
EU/TACIS	European Union/Technical Assistance to CIS
DOC	U.S. Department of Commerce
EF	Eurasia Foundation
ERC	Energy Regulatory Commission
FSU	Former Soviet Union
GATT	General Agreement on Tariffs and Trade
GOA	Government of Armenia
GosNIIAS	State Scientific Research Institute of Aviation Systems

GPS	Global Positioning Systems
GTZ	Gesellschaft für Technische Zusammenarbeit
IAS	International Accounting Standards
IBTCI	International Business and Technical Consultants, Inc.
ICTs	Information and Communications Technologies
IESC	International Executive Service Corps
IFC	International Finance Corporation (WB)
IMF	International Monetary Fund
InfoCom	Armenian ISP (now part of ArmenTel)
IPR	Intellectual Property Rights
ISO	International Standards Organization (e.g. ISO 9000)
ISP	Internet Service Provider
IT	Information Technologies
ITA	Information Technology Agreement (WTO)
ITAA	Information Technology Association of America (?)
ITEC Park	Information Technology and Electronic Commerce Park
ITU	International Telecommunications Union (UN)
IYC	It's Your Choice (USAID-funded NGO)
MOFE	Ministry of Finance and Economy
MOP	Ministry of Privatization
MPC	Ministry of Post and Communications
JICA	Japan International Cooperation Agency
NBIA	National Business Incubator Association
NCA	National Copyright Agency
NGO	Non-Government Organization
NIS	New Independent States
OSCE	Organization for Security and Cooperation of Europe
PAROS	??database
PHC	Primary Health Care
PWC	Price-Waterhouse-Coopers
ROA	Republic of Armenia
RSTL	Republican Scientific and Technical Library

SMEs	Small and Medium Enterprises
SRI	Scientific Research Institutes
TRIPS	Trade Related Intellectual Property System (WTO)
UEC	Universal Election Code
UNCTAD	United Nations Commission on Trade and Development
UNIDO	United Nations Industrial Development Organization
UNDP	United Nations Development Program
USAID	U.S. Agency for International Development
USDA	U.S. Department of Agriculture
USG	U.S. Government
WB	World Bank
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

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Background

During the past several years, USAID has increased its focus on leveraging Information and Communications Technologies (ICTs) within its development activities. In the last year and a half, one thread of this special focus has been in the form of the White House sponsored Internet for Economic Development (IED) Initiative. At present this IED Initiative has resulted in 19 countries being identified for focus. As part of this effort, several IED Assessments have been undertaken in an effort to identify obstacles and opportunities where ICTs can be better leveraged to add value to existing development activities.

While at present Armenia is not one of the designated IED countries, one of the important outcomes of the IED Assessments carried out to-date has been the development of a template. This has been found to have application not only for the IED-designated countries, but also for other countries wishing to undertake similar Assessments in an effort to identify opportunities for the Mission to consider. Such is the case with this ICT Assessment undertaken in Armenia.

In the case of Armenia, this ICT Assessment builds on considerable investments by USAID/Armenia over the past 4-5 years—where ICT-related activities have been undertaken as key components to larger development activities. These activities (see Section V) are considered quite successful and fundamental to potential future expansion in the area of E-Commerce/E-Business.

The ICT Assessment also builds upon the more recent and broader interest currently taking place within Armenia relative to promoting the expansion of a small but potentially critical Armenian-based software sector. This interest builds on the historic engagement by Armenia in the electronics arena while it was part of the Former Soviet Union (FSU). It also seeks to leverage a number of existing local software companies that have emerged in recent years, several with strong links to U.S. high tech firms.

The ICT Assessment was very fortunate not only to have within team, those with a history of being directly engaged in USAID/Armenia's recent ICT-related activities, but it also had the advantage of being able to obtain rich information from several recent ICT related studies regarding Armenia. As it turns out, during this last year there have been various efforts undertaken by development Agencies to explore the viability of an ITEC-Park, High Tech business incubators, expansion of the software sector, etc. The Assessment Team was also fortunate to work in collaboration with a Small and Medium Enterprise (SME) Assessment Team from Price-Waterhouse-Coopers (PWC) who were in country during the same period of time.

In summary, the ICT Assessment activities consisted of pulling together the prior ICT-related efforts of the USAID/Armenia Mission, together with other recent ICT-related studies carried out by others, verifying and expanding the knowledge base by targeted interviews of key public and private organizations/individuals, and developing preliminary recommendations which were vetted and refined for inclusion into this Report. In several areas the obstacles for progress and requirements needed to move Armenia forward in key areas are more than likely beyond the scope of engagement for the USAID/Armenia Mission. However, these have been identified and are discussed in order to present as broad a picture as possible, and also to identify existing limitations to progress imposed by these obstacles. Potentially, USAID can work with the GOA and perhaps other multilateral and/or bilateral Agencies toward the aim of generating movement on a few of the key issues.

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Pipes

One of the underlying components that are increasingly being recognized as critical to development, is that of the telecommunications infrastructure. In recent years this has become even more critical as Globalization expands and as it increasingly relies of Information and Communications Technologies (ICTs) as a fundamental component of this global expansion (e.g., E-Commerce, E-Business).

This Section of the ICT Assessment examines the in-country telecommunications environment from several perspectives and levels, including; 1) the products/services provided by ArmenTel, the monopoly carrier, 2) those services provided by local Internet Service Providers (ISPs), and 3) the examination of comparative data sets based on 1998 data from the International Telecommunications Union (ITU).

Summary/Analysis

The telecommunications situation in Armenia can be described with two dominant elements; 1) a struggling economy with low per capita GDP with relatively modest demand for telecommunications services, and 2) ArmenTel, a monopoly provider with a virtual lock for 13 more years on the nation's connectivity. What incentives do exist for making additional investments are not the result of any competitive pressures (i.e., there is no competition), but rather are being forced upon it by the GOA (per its initial agreement and as partial equity owner). Under the current default no competition will materialize in the local marketplace until 2003 when ArmenTel's exclusive license for mobile services ends. Discussions with the Ministry of Post and Telecommunications (MPT) indicate even this is in question.

In the short term it appears the potential opportunity for leveraging Telecommunications as a tool for bringing about social and economic improvements will be shunted. ArmenTel will most likely continue to price it's services at higher, profit-maximizing pricing levels, and continue to invest at below optimal levels to expand their Telecommunications infrastructure. While the Ministry of Post and Communications has the legislative authority to regulate the Telecommunications Sector, in fact ArmenTel *is* the Telecommunications Sector and they have obtained an exclusive position.

Simply put, ultimately this situation needs to change. If left as is this will continue to retard economic growth. It will continue to be an obstacle for encouraging Direct Foreign Investments (DFI) into Armenia by the high-tech sector—a sector that hold some promise for Armenia but also requires high-level and reasonably priced connectivity. This problem is well understood by a broad cross-section of both private and public sector organizations and individuals. However, as yet there does not appear to be the political will to address this situation directly. While in itself this is not a "silver bullet" that will solve everything, it is of such importance that if not addressed, it will significantly limit the success of other initiatives where telecommunications is an important component.

At present there is no competition in telephony (landlines and Cellular), or for the International gateway connection. There is, however, competition at the local Internet Service Provider (ISP) level with several ISPs operating in Armenia. This is having an impact on pricing with a general trend of lowering prices taking place in the market. Also, while ArmenTel maintains a monopoly on all outgoing telecommunications, it is now possible to install and operate a Very Small Aperture Terminal (VSAT) for receiving incoming traffic. At least two of the larger ISPs are now doing this (or planning to do so)—the result being improved performance at a lower cost. Some of these cost savings are being passed on to their subscribers. Also, for private companies operating in Armenia it is possible to obtain a license for operating a two-way VSAT-based network for obtaining Internet access. This is allowed only meeting a company's own internal data communications needs and cannot be resold.

Telecommunication Environment

A monopoly provider, ArmenTel, dominates the Telecommunications Sector in Armenia. This company provides basic telephony services as well as cellular and international. ArmenTel is owned by OTE (90 percent), and the Government of Armenia (10 percent). The monopoly position was established for a period of 15 years—beginning in 1998 when OTE acquired ArmenTel.

The only competition within the Telecommunication Sector is that there are at present, several Internet Service Providers (ISPs) operating within Armenia. For the most part these are within Yerevan, although some are now, and others have plans, to expand to secondary cities.

ArmenTel

The following background regarding ArmenTel is extracted from a recent publication from the Armenian Development Agency (AMA).[1]

> *ArmenTel was originally established in March 1995 as a joint venture between the Armenian Ministry of Communications, which held 51 percent, and Trans-World Telecom Limited, a group of telecommunications service companies with businesses in the U.S. and Russia, which held 49 percent. ArmenTel owns all the main telephony assets in Armenia, Trans-World had contributed equipment and cash, valued at US$ 10.25 million.*
>
> *In 1995, ArmenTel began rebuilding the basic telephone infrastructure for services to five major population centers in Armenia. It also invested in GSM and paging services and installed the first stage of a modern network management system, a management information system, and an information and billing system.*
>
> *In 1997 the Ministry of Communications appointed Merrill Lynch to advise on the further privatization of ArmenTel. Merrill Lynch ran a two-round international public tender for the sale, which was won by Hellenic Telecommunications*

[1] Country Profile – Armenia. Armenian Development Agency. P.31

Organization, known as OTE, of Greece. OTE is a full service telecommunications provider offering public telephony services throughout Greece, where it is the largest company in the country. The Greek State is its major shareholder (70 percent), and the remaining 30 percent are listed on the Athens and New York stock exchanges.

In March 1998 OTE acquired a 90 percent stake in ArmenTel for US$ 142.47 million, buying out Trans-World and most of the Ministry of Communications shares; the ministry retaining a 10 percent stake. By this time ArmenTel was already providing most of Armenia's telecommunications services including public switched telephone services, GSM, data transmission, cable television and paging services, under a license giving it exclusive fixed-service operating rights for 15 years, and five years of exclusive GSM operations.

The new owner assumed ArmenTel's US$ 43.0 million of supplier credits and agreed to invest US$ 300.0 million over 10 years, to lay 20,000 kilometers of fiber-optic cable, and install digital switching to provide services to 800 Armenian towns and villages. Digitalization will rise from 4 percent to 50 percent, leading to a dramatic increase in call completion rates. The aim is to reach the government's target of national average teledensity of 20 percent by 2004.

The ADA report reflects that at present, Armenia has approximately 580,000 telephones and an average teledensity (phones per 100 inhabitants) of 17 percent. Telephone revenues are placed at 2.3 percent of GDP, and expected to rise to 2.7 percent by 2000; 4.3 percent by 2005.

The ADA country profile goes on to acknowledge that the extent of the investments and buildout has not gone according to the commitments, and that this is a significant issue. This was verified during the course of our interviews with not only ADA, but also virtually everyone else having dealings with ArmenTel.

While there has been some anticipation (and commitments made) that the acquisition by OTE would lead to a significant investments, expansion, and improvement in the quality of telecommunications within Armenia, there is growing concern this is simply not developing as rapidly as anticipated. To address this issue, there appears to be considerable discussions taking place within the Government of Armenia (GOA), as well as others, to bring about some change in the current situation. It seems to be well understood even at the presidential level that the monopoly situation with ArmenTel is currently an obstacle that may well be impeding the socio-economic development of the country. At one point in recent months discussions took place between ArmenTel and the European Bank for Reconstruction and Development (EBRD) in the hopes of partially addressing this situation by having the EBRD buy a 10 percent share of ArmenTel. This dialog included seeking an agreement with the GOA that would reduce the current 15 year monopoly to 5 years—allowing competition into the local market 10 years earlier than what is now destined to take place. In recent weeks however, these discussions have been suspended as EBRD is reviewing its pursuit of this engagement.

Internet Service Providers

At present there are at least four major Internet Service Providers (ISPs) operating in Armenia. The largest of these is Arminco, a joint venture with MCI (USA) with an estimated 3,000 current subscribers (business and residential). Armenian Computer Center (ACC) is the second provider that has focused on business and government customers and is experiencing rapid growth. Yerevan Institute of Physics is the third major ISP.

The following provides the basic information on the two largest ISPs:

- **Arminco-Global Telecommunications**

  Armenco is perhaps the leading ISP in Armenia. The company provides a full-spectrum of Internet-related services to include E-mail, Web Hosting, Hosting of customer-specific servers, etc. It has Points of Presence (POP) in several locations throughout Armenia at Yerevan, Qyumry, Vanadzar, Hrazdan, Echmiadzin, Stepanakezt, and Sisian. Efforts are underway to also put a POP in Armavin and Gavar. The company has 35 employees.

  Arminco has at present 3,000 subscribers, with 1,500 new subscribers added in the past year—a number that reflects significant Internet growth is taking place. Annual revenue this last year is placed at US$ 600,000. Internet pricing for access is US$ 50/month for unlimited use any time of the day, and US$ 20/month for unlimited use between 8PM and 8AM.

  Arminco acquires its bulk Internet access through ArmenTel, and at present has the equivalent to a T-1 total capacity (1.544 Mbps). Arminco's total capacity is acquired through a dual-route approach where their outroute is via leased line through ArmenTel, and their inroute is via a receive-only Very Small Aperature Terminal (VSAT). With this dual-route approach their monthly international access costs are running US$ 30,000. For comparison, if the entire T-1 capacity were acquired via ArmenTel the total monthly connectivity costs would be on the order of US$ 45,000/month. It should be noted that a full T-1 link to the Internet in the U.S. this would be less than US$ 2,000/month).

  Connectivity between Arminco's customers and Arminco is via a modem pool consisting of 300 modems capable of supporting speeds up to 56Kbps. Armenco also has put into place eight Wireless Access Points (WAPs) for providing higher volume capacity to larger commercial accounts.

  While most of Arminco's business is in Yerevan, it also provides service to several locations outside of Yerevan. This is via a VSAT for downlink, and modem (33.6Kbps from secondary city to Yerevan) for their outroute.

  Clearly Arminco is being successful and experiencing growth, however the current charges it must pay ArmenTel for Internet access are simply excessive and the result of monopoly pricing (e.g., monopoly profit maximization behavior). Growth in the Internet use within Armenia would likely expand even faster with cost-based pricing. In addition, there is some

risk to even sustaining the current growth levels as ArmenTel appears to be considering implementing local call metering. The result of such an action would be to increase Internet access even more than the present levels, thus lowering use.

- **Armenian Computer Center (ACC.am)**
  ACC is considered by many to be the second largest with a special focus on providing access to the various Ministries within the Government of Armenia (GOA), and businesses. For the most part these customers are connected via leased lines from ArmenTel (with an initial connection fee and a small monthly fee). Once this capacity is in place, then ACC provides the Internet connectivity anywhere from 19.2 Kbps (US$ 720 a month) to 256Kbps (US$ 9,600 a month).

  In addition to these leased line customers, ACC provides dialup access and currently has approximately 750 dialup accounts. This number has been growing at the rate of about 40/month new subscribers since they established their business in the fall of 1998. ACC provides both a daily and monthly pricing plans. For their daily service, plans pricing ranges from US$ 16/month for two hours a day, to US$ 40/month for 5 hours a day. Their monthly services range from US$ 20 for 50 hours a month to US$ 55 for 150 hours a month. Additional hours are at US$ .50/hour.

  ACC is also working with ArmenTel to establish what they refer to as the Armenian Project on International Network (ArPINet). This network will rely on an E-1 fiber-optic backbone to all 11 regions of Armenia and Artsakh. Some of the local connection in Yerevan will rely on HDSL over copper.

  In addition, ACC will be offering a '181' access number throughout all of Armenia for accessing the Internet without paying any long-distance charges. This is a feature promised by ArmenTel, but as yet not available.

- **Other ISPs**
  Estimates on the number of ISPs operating in Armenia vary from 3-5 to as many as 30. The general consensus is that there are less than 10 that have any significant customer base.

ITU Telecommunications Information

Each year the International Telecommunications Union (ITU) publishes a World Telecommunications Development Report.[2] It's most recent report issued on 10 October 1999, included an expanded set of data that for the first time included data on mobile Cellular. In addition, it reflects indicators on basic telecommunications, international, TV use, as well as the Internet. While during the course of this Assessment there was reason to suspect the accuracy of this data, it must also be recognized that the data is 1998 data—two years old. And in a rapidly-changing environment (e.g., growth in some subsectors can be in excess of 100% CAGR (Compound Annual Growth Rate), current data may be significantly different than what's reflected in this Report.

[2] World Telecommunications Development Report—1999. Mobile and World Telecommunications Indicators. ITU. Geneva, Switzerland. 10 October 1999.

The ITU data is based on a stated population of Armenia being put at 3.54 million—recognizing that some estimates place this number as low as 1.5 million, less than half of the 3.54 million used by ITU. As defined in the ITU Report, Armenia is considered a "Low Income" country; Low Income defined as those countries with a Gross National Product (GNP) per capita as being US$ 785 or less. The ITU reflects the annual per capital GDP for Armenia at US$ 429.

A series of tables with data extracted out of the ITU report is reflected as Appendix A. For purposes of this analysis, Armenia data was compared to that of both neighboring countries (e.g., Azerbaijan, Georgia, Iran, and Turkey), as well as those countries with which it has a historical and/or current economic linkages (e.g., Russia and Turkmenistan). In addition, average data is reflected for Low Income Countries as well as Europe, the U.S., and the World—providing a regional, income-level, and global context for the Armenian data.

The following provides key summary observations resulting from reviewing and analyzing these sets of data. For more detailed analysis refer to Appendix A.

Telephone Infrastructure – Basic Information

The ITU places the number of landlines in 1998 at 556,000 (492,600 of which are residential) and 7,000 cellular phones. This is quite close to the recent ADA publication indicating 580,000 lines in Armenia. ITU puts the Compound Annual Growth Rate (CAGR) between 1995 and 1998 at –1.6%. Teledesity for Armenia is placed at 15.72 for the entire country—a number quite consistent with neighboring countries with the exception of Turkey which has nearly twice that number (at least in their largest cities). The ITU also reports that there was a waiting list for new phones of 110,000 in 1998. Faults per 100 lines were put at 20—a very low number compared to other Low Income countries.

Basic Telephony - Tariffs

Connection fees for both residential and business is considerably lower than neighboring countries. This is likely less than actual costs for delivering these services (US$ 48 and $57 respectively). Interestingly the monthly subscription costs are higher for residential than they are for business lines—an inverse of normal business practices where business use is typically used to cross-subsidize residential use. Residential monthly subscription rates are more than neighboring countries where as business monthly rates are substantially less. Overall tariffs are placed at 3.4 percent of per capita GDP—very high comparing to neighboring countries.

Cellular – Subscribers and Tariffs

In 1998 there were 7,000 cellular subscribers in Armenia providing a teledensity of 0.20 (subscribers per 100 inhabitants). Connect costs are high compared to neighboring countries as is the use of the Cellular phones. As a result, the percent of total cellular use is running significantly behind neighboring countries (with the exception of Turkmenistan). In many developing countries Cellular systems are used to substitute land-line based build out as it's typically faster and can be less expensive—especially in low density areas. This clearly is not the strategy in Armenia.

International Traffic
Considering the small population in Armenia the amount of outgrowing traffic is considerable—with averages of per capita and per line considerably higher than neighboring countries (16.0 minutes per inhabitant; 101.9 minutes per subscription). This higher number is likely due to the large number of Armenians living outside of the country, but potentially still constrained by the high international tariff rates on outgoing calls.

Telecommunications Staff
In looking at the number of employees relative to the number of main lines, Armenia (ArmenTel) appears to be relatively lean by comparison to its neighboring countries as well as the average for Low Income Countries.

Telecommunications Revenue and Investments
With respect to revenue per main line as well as per employee, Armenia is in the lower third of Low Income Countries (US$ 86 per line and US$ 5,691 per employee). With respect to investments per mainline, Armenia is at the lower end of Low Income Countries (US$ 29). However on a percent of revenue, ArmenTel's investments in 1998 were 33.6 percent of revenue—toward the higher end of Low Income Countries. This appears to be on the order of half of what OTE's agreement was (US$ 300 million over 10 years), but still considerable as a percent of revenue.

Information Technology – Internet and PCs
ITU data places the number of Internet users in Armenia in 1998 at 4,000 and the number of PCs in country at 15,000. Discussions with the two largest ISPs indicate rapid growth over the past couple years with current estimates on the number of Internet users at 60,000-100,000, and the number of PCs at 25,000-30,000.

Network Growth
The ITU data breaks down the Network growth into three areas; new telephone lines, new mobile subscribers, and new Internet hosts. The growth data is between 1997 and 1998. For telephone lines, the ITU reflects negative growth of 11.8 percent in the total lines. For cellular subscriptions the compound annual growth rate (CAGR) is put at 40 percent--high but on a low base of only 2,000 new users. The CAGR for the Internet is put at 115.2 percent—again, a high percent but on a low base with 500 new hosts being added in 1999, and a figure that corresponds to expanded Internet use.

Year 2000 Projections – Main Lines and Cellular
The ITU also includes in its report a projection on the number of main telephone lines and cellular users. This projection continues the negative growth with the number of lines/100 inhabitants falling from 15.72 in 1998 to 13.53 in the year 2000. Teledensity for Cellular subscribers is projected to double between 1998 and 2000 (.20/100 to .40/100).

NOTE: It should be kept in mind that the above data from the ITU is based on an official population in Armenia of 3.54 million. This appears to be a somewhat inflated number with the actual population being somewhere between 1.5 and 2.0 million. Assuming these lower

unofficial estimates are more accurate, then many of these statistics are suspect, considerably understated, and while of value for comparisons, etc, caution should be used in use of this data as a foundation for initiating specific actions.

Another critical component included in this ICT Assessment was that of the Government of Armenia's (GOA) position relative to ICTs. Specifically this focused on two key areas: 1) the Government's policy and legal framework on those areas that directly and indirectly impact the expanded use of ICTs within Armenia and 2) the GOA's actual use of ICTs to automate and streamline key Ministries and functions/activities that they carry out.

Summary/Analysis

There is every indication that the GOA has identified the ICT Sector as one of its priorities for Armenia's future economic growth. This was recently highlighted in an interview with the Minister of Industry and Trade, Karen Chshmaritian, appearing in the 7 June 2000 issue of Noyan Tapan Highlights. In this interview Mr. Chshmaritian noted the need for upgrading both the information technology infrastructure, upgrading the technical skills in the local market, and securing international investments. He made specific mention of the GOA considering the notion of establishing a "Technopark" to support growth in this area. The text of this interview is reflected as Appendix D.

Taking into account the current position by the Ministry of Post and Communications (MPC), it appears safe to assume that the MPC will continue with the current ArmenTel approach. While perhaps investing in building a digital infrastructure, it has far to go relative to providing rich customer service as a reasonable price level. Firms wishing to locate in Armenia will likely need to put their own international telecommunications/Internet capacity in place. A GOA-sponsored program of IT/ITEC Park, concessions with regards to lowering and simplifying taxes, etc., will be needed. And if these types of aggressive and focused initiatives aren't forthcoming from the GOA, there will no doubt be some growth, but nothing along the lines of what is needed to contribute significantly to the local economy.

There is also the need for updating legislation in order to support expansion of economic growth via the Internet; e-Commerce/e-Business. In the subsequent Section of this Report, Private Sector, areas for potentially leveraging the Internet via e-Commerce are identified. However in order to take advantage of this potential, legislative changes are needed with regards to electronic signature, intellectual property rights, encryption, privacy, etc. These changes must take into account the emerging World and Regional frameworks being adopted by those countries with which Armenia seeks to do business.

It should also be noted that while building an ICT sector within Armenia appears to be plausible, there is the issue that continues to emerge and needs some attention: leveraging ICTs across all sectors of society. If ArmenTel is extending the reach of telecommunications throughout the country (as indicated in an interview with the MPT), consideration should be given to how those living in these remote areas will be provided access. There likely is the need for a complementary effort of providing Universal Access via share-access TeleCenters that can

support local small and micro businesses, individuals, farmers/agricultural activities, health clinics, education, etc.

The quick inventory of ICTs deployed within the GOA as part of their Y2K efforts indicate that the government is likely the single largest source for the "demand" of ICTs within the local economy. Also, it appears there is sufficient critical mass beginning to emerge within the GOA Ministries such that consideration is given to establishing a set of E-Government services. These may range from simple access to information, to actually being able to carry out some levels of transactions (e.g., filling out a form, applying for a business license, etc.) without having to visit the Ministries. This type of an initiative could also have a significant impact to improve transparency of key processes than what will otherwise occur with the current manual processes.

Public Policy

The following provide a brief synopsis of Public Policies that have a determinant impact on the use and expansion of ICTs within Armenia.

Telecommunications

The Telecommunications sector is shaped in large part by the Law of Telecommunications. This Law was put into place and signed on February 20, 1998, by the then acting President of the Republic of Armenia, Prime Minister of the Republic of Armenia, Robert Kocharian. Mr. Kocharian has since been elected as President of Armenia. Responsibility for regulating telecommunications within Armenia is designated to be the Ministry of Communications.

In short, the Law of Telecommunications (via License 60), acknowledges that the Armenian Telephone Company (ArmenTel), has exclusive rights to provide telecommunications throughout Armenia for 15 years (5 years for cellular). This license was granted on June 25, 1997, before the passage of the Law of Communications, and unless there is a change, its license will be in effect until 2012.

The GOA's responsibility for guiding the public policy with regards to telecommunications is located in the MPC. As reflected in the earlier Section on ICT, in summary the GOA has privatized its telecommunications by giving a 15-year monopoly license to ArmenTel. The GOA retains a 10 percent ownership, which has the impact of making MPC an equity-based business partner with ArmenTel. While their percent ownership is relatively small, their position is that they provide considerably greater influence than their percent ownership would indicate.

Discussions with the Deputy Minister and one of his staff indicated that ArmenTel, *"…is doing a very good job,"* and that *"…they don't see a problem."* While they acknowledge the downside of having a monopoly provider in Armenia, they are pleased with the current level of investments, the amount of digitization and fiber that is being laid throughout the country, etc. They forecast that by the end of the year, the entire country will be served, which will include mobile access being available in the capital cities of each province. They also reflected that by the end of the year they will have GSM roaming agreements with 60 countries in place, and that once the buildout is completed, there will be price reductions.

With regards to the present monopoly position of ArmenTel, the position of the MPC is that it is not an inhibitor with respect to Internet access. First, they indicate there are between 30-35 Internet providers within Armenia; 10 with significant operations. And second, they have taken the position that any company can obtain its own license to operate a Very Small Aperture Terminal (VSAT) and that 6-7 companies are doing this at present. The only restriction is that this capacity is for their own exclusive use only—that it cannot be resold. At the same time they recognize the current pricing of high-capacity Internet is 10X that of what's available in the U.S. They also recognize that when licenses are requested by private companies that they in fact get an "unofficial" approval from ArmenTel before granting the "official" license to operate. There also appears to be some question as to the duration of ArmenTel's monopoly on Cellular.

In summary, it appears that with regards to regulation of Telecommunication within Armenia, there is very little if any. Rather than shaping via regulation, the direction of Telecommunications sector is being set by the GOA putting influence on ArmenTel as an equity partner. There are significant disparities between what the MPC feels is ArmenTel's progress/state of service and what those receiving their services (businesses and individuals)—both with regards to the negative impact on current pricing and the quality of service.

Yet, while this is taking place, it does appear that businesses seeking to invest in Armenia do have the option of establishing their own international Internet access and bypassing ArmenTel's monopoly, so long as they do it solely for their own use. It's not clear if this could be such as to support a shared-access VSAT for multiple firms in an IT Park or even a building.

Law on Foreign Investments

In brief, the GOA has adopted a very liberal position on allowing and even encouraging Direct Foreign Investments (DFI). This was originally put in place in 1993, but recently updated in 1997. Overseas investors can own all or part of any business operating in Armenia, and receive full legal protection, as would an Armenian citizen. In addition, there is a nearly unrestricted ability to move funds into and out of the Republic of Armenia. The only restriction at present is that a non-Armenian citizen cannot own real property within Armenia. Although this is a restriction, it is not thought to be a significant deterrent from encouraging foreign investors.

Taxation

The Armenian Development Agency (ADA) has recently published a Tax Guide that puts forth the current tax laws that are in effect within Armenia. This Guide is relatively straightforward and its content is not repeated here except to state the following: 1) that there are numerous taxes (e.g., profit tax, social security tax, income tax, value added tax, excise tax, property tax, land tax, and withholding tax), and likely more, 2) while individually none of these are unusually high, in aggregate they can be considerable, 3) there are some incentives for new investments by excluding or reducing profit taxes in early years (e.g., tax holidays), 4) the rules are considered by some to be overly complicated, but more importantly there appears to be some ambiguities in how these rules are applied in any given situation (resulting in some lack of predictability), and 5) it appears there are continual changes in the tax code and administration.

The end result is simply that the current tax code is not as conducive to doing business in Armenia as it could be. It is one issue if a business is already located in Armenia as it is simply a factor of doing business. However, it's quite another matter with respect to encouraging outside businesses to locate in Armenia and put investments into Armenia. In the area of ICTs especially, the business is global, and firms will simply locate where the conditions are favorable, clear, and stable. One of the advantages of government-supported high-tech or Industry Parks is that the rules are clear and enforcement not subject to frequent reinterpretation and change. If the GOA wants to encourage the high-tech Sector to come to Armenia, this needs to be addressed.

Law on Privatization

A new law on privatization along with the GOA's new privatization program were adopted in December 1997. The specifics of the overall focus on privatization in reflected in a recently issued publication from ADA, with the details not repeated in this ICT Assessment. In summary, the current activities build off of a privatization effort launched by the GOA soon after gaining its independence from the FSU in 1991. A Ministry of Privatization is responsible for overseeing these activities. To date some of the more significant privatization efforts have been the Yerevan Cognac Factor, a number of Yerevan hotels, and ArmenTel. In total, through June of 1999, approximately 1,500 medium and large sized enterprises and 6,700 small enterprises were privatized. Approximately 770 medium-sized and large enterprises have been approved by the National Assembly for sale, along with over 700 unfinished construction sites. These include companies in the Energy sector, Electronics and Electro-Mechanics sector, Mining and Metallurgy, Jewelry, Machine-Tools, Building and Construction Materials, Chemicals, Clothing, Wood Processing, Transportation, and additional Hotels.

E-Commerce-Related Legal Environment

Electronic Commerce includes commercial transactions such as electronic trading of goods and services, electronic fund transfers, electronic share trading, electronic bills of lading, public procurement, direct and consumer market. The application of electronic commerce continues to grow exponentially, by allowing interaction electronically rather than by physical exchange or contact.

The World Trade Organization has estimated that global revenue from Internet trade could be US$300 billion by the year 2001. Commercial transactions over the Internet are projected to grow from just one percent of all commercial transaction in the US in 1996 to 2-3 percent by 2001 and then to 14 percent by 2007.

Armenia can not afford to stay out of the most important technological breakthroughs of this decade. Armenia's current geographic isolation, mainly due to the embargo of Armenia's transportation routes by two of its four neighbors (Turkey and Azerbaijan), as well its small population, highlight the urgency of creating the requisite infrastructure for the introduction of E-Commerce, which would become Armenia's gateway to the global economy. This access to the global markets will bring about invaluable benefits to Armenia's economy by increasing employment, facilitating business growth, and increasing tax revenues through the use of electronic payments.

By adherence to a number of multilateral agreements and conventions, Armenia has made a commitment to implementing important legislative reforms, which will allow the development of Armenia's economy and technology. However, parallel to the enactment of legislation, efforts should be made to correctly implement the laws, in order to foster the creation of an environment that welcomes international commerce.

Intellectual Property Rights

Intellectual property, according to Article 1100 of the RA Civil Code, is defined as "results of intellectual activity and means of individualization of participants in civil commerce, of goods, of work, and of services". Intellectual property includes:

1. Works of scholarship, literature, and art;
2. Performance, phonograms, and transmissions of broadcasting organization;
3. Inventions, utility models, industrial designs;
4. Achievements of plant and animal breeding;
5. The technology of integrated microcircuits;
6. Undisclosed information, include secrets of production (or know-how).
7. As well as means of individualization of participants in civil commerce, of goods, of work, and of services, such as
   - Firm names;
   - Trademarks (and service marks);
   - Names of places of origin (or designations of origin) or goods.

Legislative Reform and the World Trade Organization—Armenia first applied to the World Trade Organization ("WTO") in 1995. In an effort to be admitted into the WTO, Armenia has made great efforts to shape its trade policy in order to comply with WTO requirements, and has adopted a schedule for the enactment of relevant laws (Decree 606). As a result, a number of amendments to the Civil Code, the Civil Procedure Code, the Criminal Code as well as the Customs Code have been adopted.

> **Civil Code:** On February 7, 2000, the National Assembly adopted a series of amendments to the Civil Code, dealing with IPR, and the President adopted the amendments on March 7, 2000. The translation of the adopted amendments is provided under Appendix 3.

Civil Procedure Code: The draft of amendments to the Civil Procedure Code was introduced to the National Assembly earlier this year, and in May they were adopted in the first reading[3].

Customs Code: The National Assembly has adopted, in the first reading, the draft amendments to the Customs Code, dealing with IPR.

Criminal Procedure Code: the National Assembly adopted the amendment to the Criminal Procedure Code on November 1, 1999, and by the President on March 31, 2000. The amendment to the Criminal Procedure Code simply extends the authority of the customs investigative body to include the investigation of breaches in the sphere of intellectual property.

Criminal Code: Amendments to the Criminal Code were adopted by the National Assembly, in the first reading, on November 15, 1999, bringing the Criminal Code in compliance with the Paris Convention and the TRIPS agreement.

Copyright: On December 8, 1999, the National Assembly adopted the Law "On Copyright and Neighboring Rights" (the "Copyright Law"). The new Copyright Law provides protection of **database** (as a compilation of data and other materials [articles, accounts, facts, etc.], systematized in machine-readable or other form , which by the reason of the selection or arrangement of its content, is a result of a creative work.) and **computer programs**, expressed in any programming language and form (including application programs, operation systems, source code and object code). One problem exists with the new Copyright Law under Article 18, which allows the free reproduction of computer programs and machine-readable databases, as well as free recompilation of computer programs, under certain circumstance enumerated in the Law.

Trademark: The National Assembly adopted the Law "On Trademarks and Service Marks, Designation of Places of Origin" (the "Trademark Law") on March 20, 2000.

Law on Protection of Economic Competition: the National Assembly on the first reading on June 22, 2000 adopted the draft amendments to the Law on Protection of Economic Competition.

Armenia's commitment to strengthening legislation dealing with intellectual property rights is impressive. However, one serious consideration regarding the rapid reform in the legislative sector is the lack of preparation on the part of judges, and the judicial system as a whole, in the sphere of intellectual property rights. The enforcement of IPR is not widely implemented in Armenia, and consequently the judicial system is not prepared to tackle complex infringement issues.

[3] By adopting a bill in the first reading, the National Assembly gives its approval to the general concept of the bill. During the second and the third readings, the National Assembly addresses the specific provisions and the text of the bill, and officially adopts the bill for enactment.

Simultaneous to implementation of the legislative reforms, efforts should be made to educate the judges in the field of intellectual property, and assist the judicial infrastructure to prepare for the enforcement of these rights.

Adherence to Multilateral Organization's Agreements

Electronic commerce is by nature a global issue, and is therefore beyond the control of individual countries. Several multilateral organizations are working towards creating an even playing field for the expansion of e-commerce, by providing rules for governing world trade. Armenia's participation in a number of these multilateral agreements has helped the creation of liberalizing measures.

WTO and Trade-Related aspects of Intellectual Property Rights—In the signing of the convention instituting the World Trade Organization (discussed in the previous section), member states also bound themselves to a number of treaties on trade in goods and services which were annexed to the convention. One of these agreements is the Trade-Related aspect of Intellectual Property rights (TRIPs) agreement.

The Agreement on TRIPS aims to ensure the adequate protection and effective enforcement of intellectual property rights and the impartial resolution of disputes between the WTO members about such matters, to the mutual advantage of both producers and users of intellectual property. The areas of intellectual property that TRIPS covers are: copyright and related rights (i.e. the rights of performers, producers of sound recordings and broadcasting organizations); trademarks including service marks; geographical indicators; industrial designs; patents, including the protection of new varieties of plants the layout designs of integrated circuits; and undisclosed information, including trade secrets and test data.

The National Assembly of the Republic of Armenia will soon ratify the Protocol on the accession of the country to the Agreement for the Establishment of the World Trade Organization and Agreement on TRIPs.

World Customs Organization—Armenia became a member of World Customs Organization ("WCO") in 1992. WCO provides technical assistance to Member Administrations to improve their efficiency and effectiveness in all aspects of their work. Specifically, in relation to IPR and in an effort to assist Member Administration to fully implement TRIPS requirements, the WCO has been developing a joint Customs/Business training program, which includes key enforcement techniques. Armenia has been an active participant in many WCO initiatives and workshops.

World Intellectual Property Organization—Armenia became a Member of the World Intellectual Property Organization (WIPO) on April 22, 1993. On May 17, 1994 Armenia deposited a declaration of continued application of the Paris Convention for the Protection of Industrial Property[4], the Madrid Agreement Concerning the International

[4] Paris Convention For Protection of Industrial Property: Inventions (patents), trademarks and Industrial designs.

Registration of Marks[5] and the Patent Cooperation Treaty[6]. On April 5, 2000 Armenia joined the Protocol relating to the Madrid Agreement concerning the International Registration of Marks and on May 3, 2000, the Bern Convention for the Protection of Literary and Artistic Works[7] was ratified in the National Assembly.

Currently Armenia is considering joining the following Conventions and Agreements:

- Rome Convention for the Protection of Performers, Producers of Phonograms and Broadcasting Organizations (1961)
- Geneva Convention for the Protection of Producers of Phonograms Against Unauthorized Duplication of their Phonograms (1971)
- Nice Agreement Concerning the International Classification of Goods and Services for the Purposes of the Registration of Marks (1957).

Encryption and Security, Electronic Signature Security, and Privacy

Encryption and Security—Ensure transaction security is a great concern in the development of E-commerce. It is essential to "secure" business conducted over the Internet. The most reliable means is through cryptography i.e. encryption and decryption techniques.

Currently there is little legislation that regulates the Internet in Armenia and there is no law regulating encryption. So far the Government has adopted a classified decree (not publicly available) on the use of encryption codes by governmental agencies. Software manufacturers willing to supply encryption software to the government agencies are required to submit the software for certification to the Ministry of National Security. There are no laws regulating the production and distribution of encryption software or use of encryption for commercial or other non-governmental purposes.

Armenia needs to establish a comprehensive policy on the standards of encryption permitted while importing and exporting data and also encryption standards for transactions within the country. The emphasis should be placed on self-regulation by the industry as opposed to government regulation.

[5] Nationals of any of the contracting countries may, in all the other countries party to the Madrid Agreement, secure protection for their marks applicable to goods or services, registered in the country of origin, by filing the said marks at the International Bureau of Intellectual Property.

[6] Patent Cooperation Treaty (PCT), which implements the concept of a single international patent application that is valid in many countries. Once such an application is filed, an applicant has time to decide in which of the countries to continue with the application, thereby streamlining procedures and reducing costs.

[7] Bern Convention for Protection of Literary and Artistic Works: novels, short stories, poems, plays; songs, operas, musicals, sonatas; and drawings, paintings, sculptures, architectural works.

Electronic Signature—Electronic signature is a generic term that refers to various methods by which one can "sign" an electronic record. Digital signature is simply a term for one technology-specific type of electronic signature. It involves the use of public key cryptography to "sign" a message.

While handwritten signatures in most cases serve merely to indicate the signer's intent, signatures in an electronic environment typically serve three critical purposes for the parties engaged in an e-commerce transaction - i.e., to identify the sender, to indicate the sender's intent (e.g., to be bound by the terms of a contract), and to ensure the integrity of the document signed.

According to Article 296 of the RA Civil Code "the use in the concluding a transaction of facsimile reproduction of a signature with the assistance of means of mechanical or other copying, electronic digital signature, or other analogue of an actual handwritten signature is allowed in cases and by the procedure provided by a statute, other legal acts, or agreement of the parties."

Despite the fact that the Civil Code authorizes the use of electronic signatures in cases of mutual agreement of the parties, the need for statutory regulation of the use of electronic signatures is essential to facilitate e-commerce.

Guideline for Introduction of Legislation—Introduction of such legislation would require the exercise of the right of legislative initiative, which is the right to initiate a bill in the National Assembly. The National Assembly shall either regulate or authorize the executive branch to regulate the matter, by adoption of relevant laws.

The right to propose a bill for consideration by the National Assembly in Armenia rests with the deputies of the National Assembly and the Government of Armenia. The Government yields a lot of power in reference to the introduction or the rejection of a bill under consideration by the National Assembly. If the Government recognizes a bill as "urgent", the National Assembly is obligated to address the bill within one-month period by either adopting or rejecting it. Furthermore, the Government may, prior to voting on a bill, support it with a "vote of confidence", which would force the National Assembly to either adopt the law or express a "vote of no confidence" in the current Government. Even though this option has rarely been used, it remains a powerful tool in the hands of the executive branch to influence the legislative policy.

Therefore, before Armenia is ready for the introduction of such legislation, it is important for the government to set up a committee of legal and technical experts, in order to assess the applicability of such law to Armenia. It is important to note that the Armenian government should support self-regulation in any electronic signature verification process, rather than the creation of state-licensed certifying centers.

Right to Privacy—The Constitution of Armenia (Article 20) grants right to privacy of correspondence (mail), telephone conversations, postal, telegraph and other communications. Such rights can be limited only by a court decision. The Constitution mandates "due process under the law" for any search and seizure. Furthermore, the Constitution prohibits collection,

possession, use and dissemination of information related to personal and family life of an individual. Even though Armenia has no separately law protecting privacy, the Constitutional provisions have direct application and provide fairly strong protection against unauthorized intervention into the privacy of individuals.

The Criminal Procedure Code sets forth procedural policies and rules for the protection of privacy, requiring court decision for any intervention into private correspondence. The Civil Code contains provisions of protection of commercially sensitive information from unauthorized use. There are various laws, such as the Bank Secrecy Act, which provide protection of privacy in certain fields. The Telecommunication Act imposes obligation on the operators to maintain secrecy of communications by users of telecom services.

However, more direct and detailed legislation is required to ensure that the privacy of communications, as most of the existing laws only generally address the privacy of individuals. For example, the Criminal Procedure Code guarantees privacy in course of procedural actions only. It does not address the issues of general surveillance, unauthorized intervention, or illicit breach of privacy outside the criminal process itself.

Customs and Accounting Procedures

Customs—In the US, as well as a great number of European countries, delivery of goods purchased via e-commerce is primarily implemented by postal and courier services. However, the postal system currently available in Armenia is both inefficient and unreliable; and the international courier services operating in Armenia, charge very high rates for delivery of packages. Furthermore, the lack of transparency of Armenian Customs rules and regulations, as well as burdensome and bureaucratic paperwork requirements, pose a great barrier to the development of e-commerce in Armenia.

Ideally, the consumer should have very little involvement between the time he orders the goods on the Internet, until he receives them. It is the responsibility of the supplier and the distributor to address safety, security and prompt delivery of goods ordered. However, with confusing administrative regulations, and unpredictable custom duties, suppliers and distributors can not accurately calculate the Customs duties, necessary paperwork and the time necessary to clear goods through Customs. Other problems such as lack of adequate facilities for storage of perishable goods and inappropriate mechanisms for the determination of customs value, just add to the inconvenience of shopping in the global market.

A lack of consistency exists in procedures used at different points and Customs houses. The customs regulations change very frequently creating inconsistency and confusion in operation of businesses. For example, recently, the license for “custom brokers” was revoked, for clearance of both imports and exports. The revocation of broker licenses adds a significant load on small companies who are generally unfamiliar with the detail and complexity of customs procedures. Although the Ministry of State Revenue officials has stated that the licenses will be reissued in the near future, if such unpredictability persists in the sphere of laws and regulations, many companies will be discouraged to use e-commerce to conduct regular transactions.

The simplification and clarification of customs rules and regulations, and improvement of delivery services for both domestic and international products and services will facilitate the development of e-commerce in Armenia, and will attract investment in the distribution and transportation infrastructures of Armenia.

There is no exemption available for goods and services physically delivered to purchasers in Armenia, however, this does not seem to pose a significant obstacle to the development of e-commerce in Armenia.

Accounting and Tax Procedures—As most of the businesses in Armenia are privately held and are under no pressure to report to the shareholders, the accounting rules and procedures are mainly used for tax reporting purposes. Accounting rules and procedures per se do not seem to contain requirements that could potentially hinder Internet transactions. However, certain tax accounting requirements can become a serious obstacle for transactions where parties are not physically present.

Determination of income tax liability for businesses is based on deductions from the gross income. The corporate and personal income tax laws define deductible items, mostly expenses. For an expense to be deductible it should be properly documented (The Profit Tax Act ["PTA"], Art. 10(1); the Income Tax Act ["ITA"], Art. 15(2)) in accordance with Government regulation 525/98. Pursuant to this regulation, an expense is properly documented if the instrument (invoice, bill, etc.) contains certain data, usually including the corporate seal (if required under Armenian law), signature, and the name and position of the person signing. Such document must be in two originals – one in possession of the vendor and the other in possession of the buyer of goods or services. All domestic companies are required to have a seal. If an invoice is not signed and sealed by both the buyer and the vendor, then the invoice is not valid for expense deduction purposes and may invoke liabilities (such as withholding taxes at source) and administrative penalties.

A similar requirement exists under the Value Added Tax Act (VATA). According to Article 18 of the VATA, individuals providing goods or services should issue a "tax bill" to the buyer, which should contain specific information such as the invoice number, date, as well as the name, address, and the tax ID numbers for the supplier (vendor) and the buyer. Article 20 of the VATA authorizes the Government to request additional information. Of course, these bills must also be signed and sealed by both parties.

These requirements substantially obstruct transactions over the Internet, where parties do not meet and have no other viable means of exchanging documents to comply with the tax requirements.

As Internet advertisement is an important element facilitating e-commerce, restrictions imposed on deductibility of expenses for advertisements abroad, under Article 16(1)(b) of the PTA, may pose an obstacle for businesses and the development of Internet commerce in general.

International taxation will raise a number of other complex tax issues, especially in the area of tax withholding obligations, where there is a requirement for withholding of 5% to 15% from any income derived from "Armenian sources". Such income is subject to withholding at the source by the "tax agent", which is any business entity making the payment. E-commerce may be substantially distorted if the tax laws do not clearly address issues related to determination of the source of non-residents' income.

In order to determine whether the purchase price paid to a non-resident taxpayer, even via electronic means of payment, constitutes income from "Armenian sources", the parties must determine:

1) the existence of non-resident "subdivision" or "permanent place" of business in Armenia,
2) nature of the transactions (purchase of goods/services or royalty), such as the purchase of the right to use a software products, music, etc.

Armenia has signed a number of bilateral and multilateral tax treaties. Businesses conducting international trade will have to refer to these treaties to determine the proper tax treatment for each specific transaction. Since most of these treaties are not publicly accessible, it is very difficult to accurately determine the tax liabilities for each type of transaction.

Transmission of electronic products over Internet itself poses difficult questions in determination of both taxes and duties imposed on import of goods as well as refund of value added tax in case of export of goods. A problem exists under VATA in respect to export of software products via electronic transmission. The export transactions are taxed at 0% VAT rate. Therefore, normally, in case of export of goods or services, the exporter will be entitled to the refund of the VAT paid for production (acquisition) of such goods and services. The issue is whether an exporter should be entitled to such a refund in case of "electronic export". Accordingly, should import be taxed when the product subject to custom duty and VAT is "electronically crossing" the boarder? How and when should such imported goods be custom cleared?

There is a need to review and clarify the tax treatment of transactions on the Internet, without introducing new taxes or uncertainties. Unless the laws and regulations are simplified and clearly defined, the distributor companies will not be able to provide satisfactory service to e-commerce consumers. The Ministry of State Revenues should provide publicly accessible information on tax decisions, in order to clear the existing confusion and inspire confidence in the use of e-commerce.

Foreign Exchange Regulation—Armenia has eliminated the Foreign Exchange Regulation, removing all restrictions on transfer of funds. Rule 5 of the Regulation No. 8 (the "Regulation") of the Central Bank of Armenia expressly allows individuals and businesses in Armenia to open and maintain bank accounts abroad and effect payments. Even though, under Regulation No. 8, the Central Bank has reserved the right to impose certain emergency restrictions on foreign exchange transactions related to movement of capital ("capital transaction"), the foreign exchange regime has been one of the most liberal in the CIS since 1995 and no such restrictions

exist today. Moreover, under the Regulation such restrictions can be imposed only by providing a notice one month in advance.

Armenia has also joined Article 8 of the International Monetary Fund ("IMF") Articles of Agreement, prohibiting a member nation to restrict current account transactions.

Therefore, the foreign exchange regulation does not pose any restrictions that could hinder the development of e-commerce. However, the low level of sophistication of the banks, the lack of technology, and the slow pace of processing credit payments must be addressed in order to expedite and simplify the payment procedures.

ICT Use in the GOA

As part of the recent Y2K initiative, the GOA undertook a comprehensive review of the use of automation within the various Ministries during March-May of 1999. As part of this initiative a Report was published on 31 May 1999, titled, "Information and Automated Systems Registration and Testing Connected with Y2K Problem." The following information on the use of ICTs has been extracted from this report in an effort to provide an brief overview of the use of ICTs within the GOA.

Ministry/Department	Description of ICT Use
Central Bank of RA (RA CB)	274 workstations, 19 servers, 7 operational systems, 6 database management systems, 10 software applications, and 14 other programs/applications, inter-bank computer network
ArmSavings Bank (ASB)	308 workstations, 2 servers, ASB payment system, 7 operational systems, 5 software applications
RA Commercial Banks (except ASB)	1, 616 computers, Novell NetWare, software from Armenia Programs and L-Soft.
Department of State Realty Unified Cadastre (SCD); in the structure of the Government of RA	50 computers and 37 electronic tachometers, 2 operational systems
Patent Department in the Structure of Government of RA (PD)	29 personal computers, 4 operational systems, 1 software application, and a number of general purpose programs, Novell NetWare
RA Tax Inspectorate (TI)	227 computers, 2 operational systems, 2 databases
RA Customs Department (CD)	113 personal computers, 6 operational systems, 6 general purpose programs, 4 software applications, Informix SQL and Informix ESQL/C programs
RA Ministry of Economy and Finance (MEF); Treasury Inclusive	447 workstations, 55 servers, 5 operational systems, 3 general purpose programs, 3 software applications, Novell NetWare,
RA Statistics, State Register and Analysis Department (SRAD)	168 personal computers, 6 operational systems, 5 general purpose programs, 3 software applications, Novell NetWare, FoxPro, SPSS, Atlas g15
Energetic System (Armengergo, Hrazdan TES, Yerevan TES, Central Electrical Network JS Companies)	1,000 personal computers Novell NetWare, Clipper, Delphi
Armenian Nuclear Power Plant (ANPP)	94 personal computers
Nuclear Reactor Control System (NRCS-	12 personal computers

"Sevan"); ANPP Block 2	
Fact Recording System (FRS)	
Operative Checking System (OSC)	
Access Control System	
Seismic Monitoring System	
RA National Seismic Protection System (NSPS)	43 personal computers, Vulkan hardware & software
Communications and Telecommunications	
ArmenTel Joint Venture LTD	500 personal computers, Alcatel switches
"HayPost" State Stock Company LTD and "Infocom Stock Company LTD	100 personal computers, x.25 network,
Transportation	
Civil Aviation	Control systems, AFTN telegraph communications, SITA and Gabriel ticketing/booking systems, GPS
State Management System	

NOTE: The above has been extracted from the 31 May 1999, report titled, "Information and Automated Systems Registration and Testing Connected with Y2K Problem." This is not presented as a comprehensive inventory of all use of ICTs within the GOA, but as an illustration of a growing reliance on ICTs during recent years.

Ultimately it is the private sector that must generate the business activity that establishes and maintains economic growth. During the time Armenia was part of the FSU, much of the local economic base was related to providing value-added engineering and electronic services for the Soviet military and space programs. When the Former Soviet Union (FSU) collapsed this had a ruinous impact on the Armenian economy—something from which it has yet to recover.

After gaining its independence from the FSU in 1991, Armenia moved rapidly into the area of privatization and trade liberalization. This has progressed throughout the 1990s, with the ADA's recent publication indicating that through June of 1999, about 1,500 medium and large sized enterprises (65% of total) and 6,700 small enterprises (90% of total) were privatized. Work continues in this area toward privatization, with the Ministry of Privatization (MOP) being responsible for managing the privatization process. This process continues.

This privatization has included the liberalization of Foreign Direct Investments (FDI) with foreign citizens and businesses acquiring ownership positions in over 60 companies. This was in part facilitated by the new Law on Privatization adopted in December 1997. FDI inflows were placed at US$ 102.8 million for years 1991-1997 and at US$ 228 million in 1998 alone.

The Armenian Gross Domestic Product (GDP) was placed at US$ 1.6 billion for 1997. Real GDP growth for 1998 was 7.2 percent, with the crisis in Russia during the latter half of the year slowing the growth considerably. This growth was largely based on high growth in agricultural output and investments due to privatization and industrial restructuring. Growth for 1999 was expected to again be slow due in part to the recent Russian financial crisis—a 4.0 percent projected for the year. For 1997, the composition of GDP was 25.2 percent from Industry, 30.1 percent from Agriculture, and 24.7 percent from Services and other.[8] For 1998 the composition of the GDP was placed at 31.1 percent from Industry, 34.5 percent for Agriculture and Forestry, 28.3 percent for Services, and 6 percent for construction. The European Intelligence Unit (EIU) forecast a 1999 growth rate of 8 percent and 10 percent for the year 2000.[9]

Summary/Analysis

Armenia finds itself in a very disadvantaged position from a number of perspectives. First, it has a relatively small population with minimal purchasing power such that its own demand for products/services is at present not sufficient to be self-supporting with regards to stimulating any significant economic growth from within. It must reach outside the country to those countries with more purchasing power. Secondly, it is landlocked, making it more difficult to reach markets outside the country in order to secure and expand its export business. This is

[8] Country Profile – Armenia. ADA. Data source is EBRD.

[9] Global Technology Markets – Country Export Potential Profiles for Information Technology – Armenia. International Trade Center, WTO OMC. Geneva 2000.

exacerbated by its neighboring countries either not having much purchasing power themselves or which have trade restrictions due to historical and currently unresolved conflicts. It is difficult to gain access to global markets without having strong regional trade . Thirdly, during its recent history Armenia has been tied to the FSU, and as a result its international linkages outside the region are with those countries that in recent years have themselves suffered economic problems. And Fourthly, ArmenTel has a monopoly on the country's telecommunications capabilities—further limiting the country's opportunity via high costs for linking to the global market electronically. This is further impeded by weaknesses in the local legal system that are not normalized with many emerging international standards aimed at promoting expanded trade via E-Commerce.

Nevertheless, Armenia does have a history in the high tech sector that reflects the potential for success in entering and expanding its participation in the ICT arena. The IT/ICT markets are expanding worldwide and there is every reason to believe that the citizens of Armenia and the private sector can actively participate not only in growing the local ICT market, but also in the international dynamics unfolding through globalization.

In fact, it is already underway. There are several Armenian software firms that have already begun exporting their products. There are also several U.S., European, and Russian companies that have established local subsidiaries in Armenia in an effort to fill their shortages of trained ICT personnel and lower their costs—thus increasing their competitiveness in the world market. To a considerable degree, these enterprises leverage off of the skills/knowledge-based developed during the Soviet era. This is being actively pursued by the Council of High Tech Executives and Entrepreneurs group with the U.S. Armenian Business and Investment Association (USABIA). See a recent High Technology and Economic Development in Armenia; A Government Policy Briefing Paper prepared on 23 June 2000 (Appendix F).

There are considerable differences that must now be added to the current situation if these new firms can have ultimate success. Firstly, the demand for products and services are from the world market, not the Soviet State. This requires the need to update business practices to include new business models that seeks to participate internationally by marketing local skills/knowledge resources. Secondly, the skills/knowledge need to be updated. While the engineering and logic fundamentals are the same year-to-year, the programming tools and approaches are vastly different with new products regularly being introduced to enhance productivity. Retooling of current human capacity in the workforce is needed and retooling the educational system (public and private) for training the future workforce is essential. And thirdly, the goals of government and private sector must be realigned—with the government providing the stable, predictable, and business-friendly environment, and the private sector providing the financing, risk-taking, and ultimate economic engine in their updated business practices.

The need exists for the private sector to collectively establish a marketing approach that creates an Armenian presence in each of the target countries—for each of those sectors seeking economic expansion. This is not simply the ICT sector: it applies to tourism, jewelry and gems, handicrafts, etc.

With regards to strengthening and expanding the ICT sector, there is the need for the private sector to establish a strong certificate-based education capability to feed the growing demand. This should include establishing curriculum, etc. In addition to a full curriculum there is the need for vendor-specific certified training and a formal certification process with Armenia.

There is also the need for a strong collaborative effort between the GOA, the private sector (those within Armenia and those in the U.S. and Europe), the educational institutions (both public and private), and the donor community. This is needed to create an enabling local environment, provide the needed incentives for investments, the investments themselves, upgrade the ICT-related skill base, and provide production and marketing linkages with the U.S., European, and FSU countries.

ICT Assessment Focus

The specific focus of this ICT Assessment relative to the Private Sector is on the ICT-related sector itself, the use of ICTs in the private sector, and the potential for further leveraging ICTs for bringing about economic growth. This narrows the scope of our discussion considerably.

Further, concurrent with this ICT Assessment, USAID/Armenia was undertaking through Price-Waterhouse-Coopers (PWC) a more comprehensive Assessment on Small and Medium Enterprises (SMEs). Throughout the ICT Assessment discussions were held between the two Assessment Teams in an effort to ensure there was collaboration and to avoid any duplication. As a result, the focus for this ICT Assessment has been limited to the ICT Sector itself, and identifying potential areas where ICTs could be of benefit to supporting economic growth in key sectors. To a considerable degree, these materials rely heavily on more comprehensive studies recently completed by several development organizations (see Appendix B).

With regards to Information Technology (IT or ICTs as used in this Assessment), Armenia has a strong and substantial history as a high tech center for the FSU. This has been documented in a series of Reports within this last year, and will not be repeated here, but rather is summarized. For purposes of the discussion here, only two sub-sectors of the larger ICT Sector were examined; Software and Electronics.

Local IT Market

Within the recently completed report, Global Technology Markets-Country Export Potential Profiles: Information Technology[10], the Armenian IT market was estimated to be on the order of US$ 200 million in 1998. This was expected to reach US$ 250 million by the year 2000. The following provides a breakdown:

[10] Global Technology Markets-Country Export Potential Profiles: Information Technology – Armenia. International Trade Center. Geneva. 2000 (Draft). P17.

Category	1998	2000
EDP Computer Hardware	30	40
EDP Data Communications Hardware	10	10
Software and Services	10	20
Telecommunications Equipment	90	100
Office Equipment	20	30
Semiconductors	10	10
Passive Components	20	20
Scientific Instruments & Control Equipment	10	20
TOTAL	**200**	**250**

NOTES: Numbers are US$ millions

Software Development

During this past year, there has been considerable attention by various groups on the potential for software development within Armenia. This too builds on the capacities developed when under the FSU, but also has the advantage of requiring minimal investments, leverages the current human resources, and represents a rapidly expanding market throughout the world. This has included a report by the ITC.[11]

Based on reports and interviews, it is estimated that there are between 20-30 local software companies within Armenia that are owned and operated by Armenians. In addition, there are 10-12 U.S. firms, and 2-3 European firms, and at least one Russian firm that own and operate subsidiaries within Armenia. It is estimated that on average, these firms employ between 30-35 each. Using a number of 40, each with 30 employees for an average, the number would total 1,200. While perhaps soft, it has been estimated that in the Soviet era as many as 10,000 were employed in the high-tech sector (software and electronics).

A recently-completed study, Assessment of Rationale for the Establishment of the IT Park in Armenia[12] Information from a study conducted by UNIDO, puts the number of programmers in Armenia at about 250, with an additional 2,000 IT specialists. This in large part built off of an earlier study conducted by the U.S. Foreign Commercial Service in Yerevan. Those firms included in this survey were relying extensively on the most current programming languages including Visual C, C++, Visual Basic, Java, SQL Server, Oracle, Power Builder, etc.

While estimates vary, a recent study on the potential of establishing a software and IT sector in Jordan places the world market for software and computing services at US$ 400 billion in 1998, with the sector reaching a projected US$ 620 billion by the year 2002.[13] As a result of this size

[11] Global Technology Markets-Country Export Potential Profiles: Information Technology – Armenia. International Trade Center. Geneva. 2000 (Draft). P. 24

[12] Dr. Victor Brjabrin. Assessment of Rationale for the Establishment of the IT Park in Armenia. UNIDO (XP/ARM/99/041). Geneva. January 2000.

[13] The Reach Initiative—Launching Jordan's Software and IT Services Industry. A Strategy and Action Plan. The Services Group, Inc. Arlington, VA. August 1999.

and growth, there are currently, and projected well into the future, acute labor shortages for software development. The UNIDO Report, while reflecting different numbers, including data from the U.S. Department of Commerce, comes to the same conclusion—there is a current shortage and a projected shortage of IT professionals worldwide. Further, the UNIDO report puts forward the notion that Armenia is well positioned to leverage the strength of its prior position during the FSU era and become more engaged in this high-growth sector.

The Report examines business models for software development—outlining the coordinated need for political and economic change, training/education, and financing (both Equity and Venture Capital). It also explores the use of technology parks in India, the U.S., Europe, China, Japan, and Russia. It also puts forward the notion of business incubators, citing U.S. statistics and variations on this common theme. The UNIDO Report concludes with a proposed approach that includes: 1) the need for an infrastructure to include office buildings, telecommunications access, and pre-networked offices, 2) the need for training and education of the local human resources, and 3) aggressive marketing—finding the customers and selling the Armenian commitment to this sector. Essential factors are thought to be government support and strong support and collaboration amongst the businesses.

Electronics

A recently completed study, Armenian Electronics Industry Survey Report sponsored by EU/TACIS, provides a rich set of information about the current and potential for developing an Armenian-based Electronics industry.[14] The Survey examined a total of 47 enterprises—breaking the industry into four major groupings: raw materials and electronic component producers, functional block producers and electronic equipment and block assemblers, system and complete device developers and producers, and others (those which had changed direction or on the edge of liquidation).

While the Report acknowledged the historical successes in the production of electronics when under the FSU, it also painted a very stark picture of this sector over the past three years. Since 1997 the production has dropped from 8.5 to 3.7 billion Drams—a drop from being 1 percent of the nation's GDP in 1997 to being but 0.4 percent in 1999. The report states, *"Currently, the majority of enterprises either do not work at all or work utilizing up to 10% of production capacity. Inability of the sector to produce competitive production satisfying today's demands is being accompanied by the increase of imports and electronic goods into the country."*

Ineffective marketing was put forth as one of the urgent problems. The survey also identified the quality of products the sector offers as being low, and that there are huge difficulties in undertaking measures to adhere to world standards. The availability of financing (lack of) was also reflected as a critical factor. Other risks identified and discussed in the Survey included market, production-technological, personnel, political, bureaucratic-clan, quick delivery, quality assurance, and price. Competitive factors included the availability of skilled and cheap labor,

[14] Armenian Electronics Industry Survey Report. HAI Consult Ltd. Consulting Company. Yerevan, Armenia. April 2000.

permanent water and electricity at affordable prices, capability of assembly productions of short production cycle, opportunities for assurance of high productivity, and quality and reliability.

While the analysis acknowledged the potential of the local market, it also acknowledged competition in this market from imported electronic products. It also recognized the potential role of the GOA in protecting local firms from imports during the early years by implementing high duties on imports. The dominant focus of the analysis was on expanding exports to the Americas (including the U.S.), Europe, and Asia. The Marketing Plan goals in each case was put forward as: 1) design and develop the network to supply the needs of the respective markets, 2) to have capable and motivated representatives in each targeted country to a) create the orders required to rapidly grow business, and b) control sales process to ensure the majority of the sockets in the Served Available Market (SAM). The potential for satisfying the industrial and consumer needs of neighboring countries was also put forward, with Armenia's competitive advantage being that of quick deliveries, close contact, and being aware of preferences reflected as competitive advantages.

The Survey puts forward a series of Recommendations for the private enterprises as well as the government. Combined, these recommendations are aimed at improving the capabilities, marketing, and local business/tax environment to encourage investments and stimulate sector growth.

There is little question that the potential as outlined in the EU/TACIS does exist. However the amount of capital required to rebuild this industry, and the time it would take, bring into question the likelihood that foreign investors could be found. This is not to rule it out, however, for purposes of this ICT Assessment, the software sub-sector appears to hold substantially more promise.

E-Commerce

This discussion on E-Commerce is included in this analysis simply as a backdrop of potential opportunities for leveraging ICTs in potential sectors that exist within Armenia and that lend themselves to potential expansion via E-Commerce/E-Business.

- **Tourism**—During the Soviet era, Armenia attracted as many as 2 million tourists each year. While this has dropped off considerably, tourism is considered by many to be one of the better future prospects for foreign investors and for expansion. The privatization of hotels is already underway with several investments having taken place since 1998. One of the potential areas for leveraging ICTs is in promoting tourism via the Internet. For 1999, leisure travel sold over the Internet in the U.S. alone amounted to US$ 7.8 billion, with forecasts showing this will grow by 700% by the year 2001. Current forecasts indicate that by the year 2004, approximately 12 percent of Leisure Travel in the U.S. will be booked over the Internet—one of the highest rates of E-tailing (i.e., selling of products over the Internet). This is not limited to the U.S., but is expanding in other countries and regions as well. Should Armenia pursue an active buildout of its infrastructure and promote tourism, the Internet holds much promise for promoting the country to the Leisure Travel market—extending its reach at a minimal cost.

- **Jewelry and Gems**—Another potential area for expanding the market via the Internet is for the Jewelry and diamonds/gems sector. This sector has received some foreign investments in 1998 with the formation of a joint venture known as Armengold. By nature of the value-added services and low weight (e.g., relative to having low shipping costs), these products hold potential promise for expanding the market reach via the Internet. The key here is to establish a market presence for Armenian Jewelry on the Internet—an effort that would need to be collective not only within the Jewelry sector, but also more appropriately within the context of a national "branding" effort that would include tourism, handicraft, etc. This would appear to hold significant potential for Small and Medium-sized Enterprises (SMEs).

- **Handicraft**—While perhaps not something of major size, Armenia, like many developing countries, does have a wonderful history of quality handicrafts. Here too the Internet can be leveraged to promote these items—again, best if accomplished within the context of a much broader national "branding" initiative.

Other options exist whereby members of the Armenian Diaspora can purchase local Armenian products over the Internet for delivery to local family member. Also, it appears there may be some potential for leveraging Business to Business E-Commerce in selected areas as an effort to expand exports of target commercial products.

The prior three Sections address Pipes, Public and Private Sectors. This Section focuses on the People element of the ICT equation. Specifically, this focuses on USAID development activities that are ICT related or have incorporated significant ICT components and ITC-related education.

Summary/Analysis

For the past several years, USAID/Armenia has been actively engaged in a number of development activities that have incorporated ICT-related components. These investments have primarily been in the area of strengthening key pubic-sector Ministries and Departments. As reflected in the earlier Sections, there are many opportunities for building upon the progress already made, and by adding complementary activities. In addition, this Assessment identifies opportunities for targeted leveraging ICTs in the private sector.

Another area of focus by the GOA, the private sector, as well as the USG, is the engagement of ICT-related education. Combined, these reflect a series of activities starting with the lower grades and going all the way through the University level. There are encouraging signs in this arena with schools being provided with PCs, etc. However, this must also include providing training to the teachers and updating/developing specific curriculum associated with ICTs—including developing University-level degrees and/or majors in computer science, telecommunications, technology management, etc.

USAID/Armenia Program

A review of the USAID/Armenia Results Review for 2001 document (dated March 1999) reflects the following Strategic Objectives:

- SO 1.2 Increased Soundness of Fiscal Policies and Management Practices
- SO 1.3 Accelerated Development and Growth of Private Enterprises
- SO 1.4 A More Competitive and Market-Responsive Private Financial Sector
- SO 1.5 A More Economically Sustainable and Environmentally Sound Energy Sector
- SO 2.1 Increased, Better Informed Citizen's Participation in Political and Economic Decision Making
- SO 2.2 Legal systems that better support Democratic Processes and Market Reforms (new: Laws are enforced and adjudicated impartially)
- SO 3.1 Reduced Human Suffering in Armenia
- SO 3.2 Strengthened Social Safety Net

For purposes of this ICT Assessment, the three broad areas of Economic/Market Reform; Political, Legislative, and Legal Reform; and improving Human Conditions, within Armenia were viewed from the perspective, "Can ICTs be leveraged to enhance the effectiveness and efficiencies of the Mission's current activities?" As reflected below, in fact there have been targeted deployments of ICTs within several key initiatives over the past several years. These

deployments have already proven successful, but perhaps more importantly, they lay key foundational building blocks for future economic development within Armenia.

In reviewing the Mission's program, there are several broad areas where ICT-related activities reflected in the prior Sections III and IV intersect with the Mission's development portfolio. Clearly there is the need for continued legislative reforms associated with E-Commerce and E-Government as part of expanding the economic growth within Armenia. In addition, there is the opportunity to assist in the area of transparency with increased reliance on providing expanded information and government services via the Internet. Enhancing both public and private education by including ICT-related skills/knowledge for developing a more capable and productive workforce is also within the scope of the Mission's program. Within the private sector itself there is the potential expansion of the ICT sector—specifically for expanding production and development of software for export, but also with regards to re-energizing the electronics sub-sector.

USAID/Armenia's Incorporation of ICTs

The United States Agency for International Development (USAID) has been engaged in IT development in Armenia for several years. Long recognizing the long history of this country in the fields of cybernetics and technical development in the former Soviet Union, USAID has invested a considerable amount of funding and technical assistance (TA) to revive this technical advantage. Each of the projects undertaken over the years has added to the ability of the Armenian economy to take advantage the new IT technology and to help position itself as a viable e-commerce player in the global economy.

Central Bank of Armenia

- **CBANet**—One of the first interventions was the design and installation of the Central Bank of Armenia's network. Since project inception in 1995 it has used the latest technologies available to operate a world-class banking network. The first equipment was installed in August 1996 and was completed in October 1996. The first banks joined on in the summer of 1997 in Yerevan. Today this interbank communications network joins together 30 banks, with 156 bank branches; 45 Treasury branches; and 4 Customs houses, for a total of 235 users. The network nodes are located in 40 Armenian cities and in Yerevan. There are 10 'city switches' and 3 Central Bank switches located in Yerevan. The are 10 servers located in major banks and in the Central Bank. The software being used is Lotus Domino. The communications protocol is currently X.25/X.28, but there is testing going on for a transition to TCP/IP.

- **Electronic Payment System (EPS)**—The first application developed for the CBAnet was the EPS. It is used to send and receive payment messages in S.W.I.F.T format from the member banks and their branches, the Treasury branches and the CBA. It connects the banking 'core' systems. The system was developed, starting in April 1997, by the CBA IT staff using Lotus Domino and Revelation VIP software. It is now in Release Version 4.

- **S.W.I.F.T**.—The connection to the international S.W.I.F.T system began in June 1997. The CBA used a unique design by creating a central hub for a shared connection of Armenian banks to the S.W.I.F.T network. This shared connection will end in the year 2001, when all Armenian banks will be expected to connect directly to the S.W.I.F.T Alliance. The hardware purchased by USAID for this project was an IBM RS 6000, using an AIX operating system and the MERVA application. OS/2 is used for the data base management system.

- **Treasury Bills Book Entry**—This project was started in mid-1998. It is used for the primary auction of Treasury bills and secondary market operations settlement using 'delivery versus payment'. All current dealers are banks. The CBA IT staff is developing this system entirely in-house. It uses an IBM RS 6000 server using an Informix database. The software is largely developed in C++ using Borland C++ Builder.

  The 'primary auctions' module will be implemented in August 2000. It is currently in testing. The 'secondary market operations' module will begin testing in August 2000, will full implementation by the end of year 2000.

- **Internet Access**—The project was implemented in mid-1998. It consists of a classroom with 4 workstations, available to all staff. The web server was implemented at the outset of the project and the CBA home page was implemented at the end of 1998, and is currently available.

  Y2K—The Central Bank of Armenia started its Y2K project in 1998. It replaced some of its computers and servers in the Central and commercial banks. Non-Y2K compliant software was replaced. The CBA reported no major failures in either hardware or software as a result of its efforts.

Ministry of Finance and Economics

With USAID assistance, the Ministry of Finance and Economy (MFE) has put together a functioning treasury. At the beginning of June 2000 the Republic of Armenia (RoA) Treasury, for the first time, swept clean all sub-accounts across Armenia, depositing government funds in the Treasury accounts of the Central Bank of Armenia. Treasury systems capable of producing so-called zero balances are a stated goal of the IMF for each of the former soviet countries. Perhaps only Latvia and Lithuania have achieved this goal.

Today there are 44 local treasuries. Four are located in Yerevan. One local treasury is co-located with each of the marzes. Each of the 14 treasuries is configured with two USAID-supplied servers, one file/application server and one backup server. Small transaction volumes in the local treasuries are handled by the workstations. Seventeen servers support the central treasury operations and functions.

USAID supplied the MFE with 290 workstations for local treasury branches, central treasury operations and functions, and for ministry functions and networking. They are all currently operational.

USAID also provided special purpose software, "LSMINFIN", which handles budget execution and off-line electronic payments using the CBA BankMail system. This software is currently installed in the MFE and the local treasury branches.

USAID also provided for the LAN cabling of the MFE headquarters building. Today there are 400 LAN connections, of which 300 are in use.

Training

USAID has provided training for the various projects in the United States, Russia and Armenia. Training for the Electronic Payment System was provided in the US. The Motorola communications training was done both in the US and on-site in Yerevan. The Book Entry system training was done in the US. IBM/Moscow performed AIX training. Y2K training was done in Armenia.

Armenian Card (ARCA)

USAID and the CBA are sponsoring the development of Electronic Transfer Payment System (ETPS), which will provide debit and credit card payment services within the Republic of Armenia. Such a system will have a number of direct impacts. These include:

- Decrease of the banknote and coins in circulation with a reduction in related expenses
- Increase in the supervision of the banknote board in circulation
- Evolvement of commodity circulation and chargeable services in the banking system
- Enhancement of the payment and settlement discipline

The ETPS or ARCA Project's main objective is the establishment of the Unified Processing Center (UPC) that will function as the access point to local and international credit/debit card networks such as VISA, Europay/Mastercard, American Express, etc.

The ETPS will employ the use of smart card technology, allowing for future growth in the functionality of the base infrastructure. The UPC will become a vehicle that will allow Armenian banks to issue and acquire local and international cards as well as process transactions made by cardholders.[15]

The purpose of the project, that is realized within the framework of payment and settlement system, is to solve economic and state problems, such as:

- Decrease the volume of cash circulation
- Increase the management level of funds' flow
- Increase the level of banking and customer services

[15] Acquiring – The ability or legal right to provide branded services through Point of Sales terminals and access services to the UPC for the authorization of transactions to commercial establishments.
Card Issuance – The ability or legal right of a financial institution to provide a branded debit/credit card to its customers.

Some of the milestones that are to be completed by 2001 are to have a system that will allow Armenian banks to:

- Issue and acquire local cards
- Acquire international cards (VISA, Europay/Mastercard, American Express)
- Issue at least one of the international cards

University Curriculum Renovation

In the past ten years a number of organizations were founded for the purpose of taking an active part in the development and introduction of information technologies. During this time, computer hardware, software and techniques have changed several times.

New relationships have emerged between organizations and in the economy as a whole. At the same time new methods and means of instruction became available. As a result of the change in business needs, both in Yerevan and in the world market, there is a now a need for highly qualified specialists in computer science and information technology.

The purpose of the Computer Learning Center is to assist in the improvement of traditionally important branches of science and technology in Armenia through curriculum renovation and technology upgrade.

The need for such intervention became apparent during several trips to Armenia by personnel working in the Office of Information Resources Management's Program Technology Transfer (PTT) activity, when it was learned that qualified candidates for IT employment were not available because the academic institutions in Armenia were not teaching what was needed by the employers. Many employers did not have the budget for training and were therefore competing for the same limited pool of qualified IT workers. In many cases, financial institutions and American software houses were paying the top salaries, thereby depriving the rest of the institutions.

There is also a need to re-train the many scientists and engineers who received their education in the former Soviet Union and who have since lost their marketability. Another group that could use the help is IT graduates who must go into military service following the completion of their academic training. By the time they complete their military service, their knowledge of technology lags behind the current state-of-the-art.

TACIS has put in a network between the various educational institutions, but it has no direct academic use. What is needed is the renovation of the curriculum and the upgrade of the IT infrastructure to better equip graduates with the skills needed by employers.

Banking Supervision - USAID FinA

A very important key to a solid economy is the trust in the banking system. USAID has done much in the former Soviet Union and in other countries to introduce banking reform. There have been many approaches to banking supervision automation tried under various USAID contracts. The approach was taken upon the notion that the automation of this process must have already

been done successfully by the banking regulators of the United States. Together with the technical assistance team and potential development contractors, the combined group visited both the Federal Deposit Insurance Corporation (FDIC) and the National Credit Union Administration (NCUA) and received extensive demonstrations and documentation of their on-site and off-site banking supervision systems. The development of the USAID Financial Analysis (USAID FinA) began immediately, using programmers from the Republics of Armenia and Georgia.

The Alpha version of the software was released in December 1999 to the Central Bank of Armenia (CBA) and the National Bank of Georgia (NBG) for testing.

The CBA and the NBG accomplished alpha test by early February 2000. During the period February 12 – 22 a subsequent mission was executed in Yerevan, which included participation by the development team, the CBA and the NBG. This February mission accomplished two important objectives:

- The progress of the CBA and the NBG in performing the Alpha test was reviewed, and a list of 'bugs' and functional modifications relating to Alpha has been compiled.

- Beta (Build 103) was released to the CBA and the NBG, along with one week of familiarisation training with this version of the software to the respective Beta test teams. The Beta Test Plan was also reviewed and agreed as part of this process. Beta included the functionality required for each site to generate nine output reports. These reports included the CAMEL ratings in use by the FDIC and NCUA.

A revised project plan has been generated to deal with the remaining development cycle, including bug fixes / functional modifications arising out of Alpha and those anticipated to arise out of Beta. The major features of this plan are:

- A mission was planned to Tbilisi to give direct assistance to the NBG in performing Beta test (The Alpha and Beta release missions were both executed in Yerevan. The mission to Tbilisi intended to provide practical support to the NBG, which reciprocates the considerable commitment they have demonstrated to this project through the Alpha and Beta test cycles).

- Beta test was completed by May 28, 2000, at which time a three-week development/ re-testing period took place in Dublin, including participation of the CBA as the primary development site.

- Assuming that no major unanticipated delays arise out of Beta test, the software should be ready for release during July 2000. This is in line with the expectations agreed with the CBA and the NBG in December 1999, and with the project schedule set out at the initiation of this project in January 1999.

Customs Network

The Ministry of Revenue needs a data communications network to improve tax and customs administration and increase overall revenues. Without a data communications networks, the Ministry has not been able to effectively monitor taxpayers and importers, collect tax and customs revenues, and develop policy. This project, currently in progress, should be considered as part of the overall infrastructure development of the Ministry.

The main component of this project is the creation of a wide area network (WAN) to share and transfer data between the Ministry's main office, regional tax offices, customs houses, and border points. As envisioned, the network will provide online access to centralized databases in the main office and facilitate data transfers among all offices. Currently data are transferred from regional tax offices and customs houses to the central office, and sometimes back again, via magnetic media. This means of sharing information not only causes significant delays, but also deprives the Treasury of a more immediate source of revenue. Implementing the WAN would allow the Ministry to share information among all offices and the Central Bank rapidly and efficiently.

Customs

USAID has worked on fiscal reform from the onset of its involvement in Armenia. A most recent project has been the implementation of a data communications network to improve tax and customs administration and increase overall revenues. In interviews with two of the contractors working with the Ministry of Revenue, there were several issues that were raised concerning the ability of the Ministry to position itself for the global economy.

The first issue was that of taxing software, both imported and exported. There is a customs duty and VAT on software. However, it is up to the taxpayer to declare the value of the property. Therefore, an Internet email with a joke attached could have the same declared value as a commercial software file, which could be, in reality, worth hundreds or thousands of dollars. Customs has no way of differentiating the files.

CD-ROMs are valued at the time of import. 'Pirated' copies of software are valued at the cost of the medium, not the content. For instance, the value of the software on a floppy disk is the price of the disk. Copies of software, normally selling in the US for hundreds of dollars, can be purchased in Yerevan from stores for 1600 Dram.

The new network is expected to increase tax income, but not all infractions will be stopped. The advantage will be immediate on the tax side. Customs will need further IT improvements to be really effective.

There is some concern whether the border posts will have data grade service from ArmenTel in order for the new network to be effective. This concern will be covered in the agreement with the network provider.

International Accounting Standards (IAS)
In accordance with USAID global sustainable development efforts, a team of IT specialists along with accountant and audit staff analyzed the IAS compliance of the management information systems of the central bank and the commercial banks of Armenia. Of direct interest was the state of preparedness at the transaction level of accounting, ability of commercial banks using IAS reporting to develop an appropriate level of risk management reports and internal audit reports.

In general the IAS accounting implementation is being supported by a number of older and disparate systems, with limited flexibility for functional changes. Each change requires newly developed code to be written, tested, and verified with the accounting department. The IAS transaction elements can be subject to poor implementation if unclear guidance or non-standard methods are used across the banking sector. The continued support of IAS software implementation is too dependent on the varying skill set of the MIS staff of each commercial bank. Uneven or insufficient training in IAS methodology can result in significant misinterpretation of key IAS transactions that would then be promulgated throughout internal management reporting structures. Better IAS integration can be achieved through reducing the cost of transaction processing, and integrating disparate systems into a single, cohesive solution. IRM is recommending using a standard open system to improve effectiveness of the IAS compliance levels and risk monitoring procedures.

Year 2000
Armenia, like any other country, had its peculiarities connected to the Y2K problem. Armenia was a center for designing of Soviet calculation devices. There are currently not many mainframe computers. Imported PCs rapidly became out-of-date, pointing out the technological dependence on foreign producers.

The Y2K Commission in Armenia was formed in November 1998 by a resolution of the Prime Minister. The task of the Commission was to make a schedule to:

- Raise awareness
- Conduct inventory and assessment
- Remedial the problem
- Test and validate systems
- Implement remediated systems

The USAID Information Resources Management (IRM) Office, in conjunction with the Agency's Bureaus, scheduled teams to visit Armenia. The objective of these teams is to:

- Follow up on the status of Y2K issues at the Mission and evaluate the Mission's readiness to face the rollover;
- Review the status of the Mission's program-funded information technology (IT) and non-IT systems in critical sectors in terms of their Y2K compliance;
- Review the status of the host country's Y2K vulnerabilities in accordance with the U.S. General Accounting Office's Y2K guidelines; and

- Re-evaluate the external dependencies of the Mission on host country services.

These reviews are based on the requirements set forth by the USAID Administrator's (Mr. J. Brian Atwood) cable on 15 September 1998 to all Mission Directors, mandating that the Y2K problem and the Mission's Y2K compliance be their primary management priority.

A Y2K Team visited Yerevan, Armenia from 17 August to 24 August 1998 to carry out an assessment of Y2K compliance in this region. The team focused on raising awareness of the Y2K issue using presentations to the Mission and local USAID contractors. The team also provided materials to the Mission and contractors (in English and Russian) to take a preliminary system inventory, and made an assessment of those systems in terms of the potential impact of their failure on the local population.

In this initial assessment, the team examined the host country's energy sector and observed that the power grid used a relatively low level of automation; however, dependence on non-Y2K-compliant power systems appeared to represent a critical point of high risk.

Another team visited Yerevan, Armenia from 30 August 1999 to 3 September 1999.
The purpose of the team's return visit to Yerevan, Armenia was to assess the Y2K status of the Armenian energy sector for the purpose of identifying and remediating Y2K issues associated with embedded systems for the non-nuclear power plants and transmission and distribution systems. The following basic elements of a Y2K program were assessed:

- awareness of Y2K issues and Y2K program activities;
- inventory of administrative computer systems, software, embedded systems, and business partners (key suppliers, customers, service providers);
- risk assessment of Y2K-related failures of the equipment and systems inventoried;
- remediation of Y2K failures.

The final report focused on the non-nuclear power generation systems, including the generation, transmission, and distribution systems.

The energy sector had been previously assessed as a potential area of high risk if found to be dependent on non-Y2K-compliant control systems.

The Y2K Team recommended specific technical fixes that were necessary, in order to leave organizations with the knowledge of how to address identified Y2K problems. However, the team's primary objective was to assess the situation and provide recommendations to USAID for remediation activities. The team's strategy included:

- Recommending a BIOS fix (software fix or BIOS replacement),
- Recommending an operating systems patch, and
- Recommending an application patch.

The majority of the technical fixes were done by the relevant organization's systems administrators, with assistance from USAID in the form of guidance and supervision by technical consultant or information systems expert.

There were no subsequent Y2K failures reported in any of the sectors visited by the Y2K teams.

ICT-related Education

One of the strongest areas of focus in examining the potential for both Public and Private Sector engagement in the ICT arena is that of building the requisite human capacity. It's obvious that during the FSU era that Armenia played a dominant role in the area of electronics/automation. And it's likely this capacity was in the country long before the Soviet era. However, there is clearly the need to rebuild and upgrade these capabilities with current technical knowledge/skills–the Soviet era having ended nearly 10 years ago. This will require some near-term jump-starting efforts as well as longer-term curriculum renovation of the more formal University programs. It'll also require retraining those with prior experience in the technical sector who have in the last nearly ten years, lost their technology edge. In addition, there is the need to ensure ICTs are built into the education system for those who will be entering the job market for the first time.

The following provides a snapshot of the current situation and key activities taking place in Armenia.

Public ICT-related Education

It is estimated that at present the educational system in country (including American University) graduates about 400 students in IT per year. However anecdotal information that surfaced from various sources indicate that as few as 25-50 of these are of real potential; with suitable skills sufficient to be hired directly into an IT job. With regards to the state-run institutions, the issues of inadequate skill development appears to not only occur at the Academy of Science institutions, but also the state universities and the polytechnic school.

These low number of graduating students having the needed skills to enter the high tech work environment appear to be a combination of several factors, including: 1) the result of the curriculum not having sufficient hands-on experience, 2) students leaving Armenia upon graduation, and 3) male students having gotten deferments while in school are upon graduation required to serve two years in the military upon graduation. Situations were sited where IT-related textbooks being used in some state universities are from the 1980s. With the dynamic changes in ICTs that have taken place in the two decades since 1980 (e.g., the first IBM-compatible PC was introduced in 1980), these materials would have minimal value in supporting skill development for holding any local IT-related job. In discussions with the American University of Armenia they did acknowledge that the more recent graduates from local universities that enter their program are significantly better qualified than they had been in earlier years. Note also the above-reference activities currently underway by USAID/Armenia with regards to curriculum renovation.

Private ICT-Related Education

While the state universities and polytechnic institutions are public, within Armenia there is also the need for private education institutions. Discussions with various ICT firms in Armenia have indicated a growth in private schools offering an array of ICT-related classes, though there is the need for more comprehensive "certificate" programs from high-quality Training Centers. In addition there is the need for certified courses and certification processes for company-specific products such as Microsoft, Oracle, Cisco, Sun, etc.

In the area of formal education the American University of Armenia (AUA) has just recently added an IT minor to its MBA program, and has started teaching it's first two classes (Java and database)—five being required for the IT minor. This is being undertaken as an initial effort with plans that ultimately there will be a Computer Science Department at AUA—in the 2-4 year timeframe.

The AUA is also engaged in the ISTC Initiative through which Armenian Engineers and Physicists are trained in ICT-related skills. This ISTC Initiative is a U.S. Government supported program. While under the current program training is being offered to 60 individuals, the AUA has effectively expanded the number participating to 100. The University received 200 applicants—and believes there are many more that are interested but simply not aware of the program. The AUA relies on an Industry Steering Committee to help shape the program with the current situation being that the local firms will hire all their graduates from this program. As to their graduate program, the AUA graduates approximately 100 students each year with less than 2.7 percent of all former graduates unemployed.

The AUA has also undertaken an activity to build-out an office complex near the University to support the local software industry in Armenia. This office complex is being networked and will be set up to house as many as 450-500 individuals. It is presently scheduled to open up on October 1,2000, and plans to lease space to software development firms. In many ways this is a small IT Park and could well be used to house ICT-related training and business incubator activities in support of the software sector.

In addition to the formal AUA program, which this last year has added the IT minor to its curriculum, there are a number of small private firms that also have begun offering IT courses (for both user and computer programmers). Some of these are actually run by the IT firms themselves in an effort to build the needed skills in the community, and select their top candidates for future employment. The Internet Society of Armenia, with support from donors, has established a Network Administration Training Center that is now becoming self-sustaining. In addition, there is a local IT Foundation that has been working with the MIT Media Lab, UNDP, the Counsel of Europe, and others to improve the overall awareness of ICTs within Armenia, and establish key partnerships between the public, private, and donor community. The IT Foundation is sponsoring a conference in Yerevan, Armenia, on the Internet and Society: Sustainable e-Development or Digital Divide on 27-28 July 2000, in an effort to build awareness and focus attention on overcoming local and regional obstacles.

These are all very encouraging signs, but there is the need to expand this education arena even more. Progress is being made in the public education system as well, with the quality of the engineering graduates from the local Universities improving, but still lacking in specific hands-on skills. Much remains to be done if Armenia is to become but a small participant in this sector.

U.S. State Department Computers in Schools Activity

For the past two years, the U.S. Embassy has undertaken a program to place PCs in schools and connect these schools to the Internet. The first Internet connection was opened in August 1998. This "Internet in Armenia's Schools" program, implemented by the U.S. Embassy in Armenia and the American Council for Cooperation in Education and Language Study (ACCELS) have introduced computer classes into local schools. The program is implemented by a $300,000 grant from the U.S. Government. Another grant of $1,000,000 is also expected to be allocated to Armenia for computer classrooms—opening up another 80 schools within the next 2-3 years. While the computers are used for classes, after hours these "TeleCenter" facilities made available to the general public under a fee-based arrangement with the goal of ensuring long-term sustainability. The first year is paid for by the program. Under this program, schools with 500 students will receive 3 computers; 500-1,000 students will receive 4 computers; those schools with over 1,000 students will receive 5 computers each.

Appendix A – 1998 ITU Statistics

Each year the International Telecommunications Union (ITU) publishes a World Telecommunications Development Report.[16] It's most recent report issued on 10 October 1999, included an expanded set of data that for the first time included data on Mobile Cellular. In addition, it reflects indicators on basic telecommunications, international, TV use, as well as the Internet. While during the course of this Assessment there was reason to suspect the accuracy of this data, it must also be recognized that the data is 1998 data—two years old. And in a very rapidly-changing environment (e.g., growth in some subsectors can be in excess of 100% CAGR (Compound Annual Growth Rate), current data may be significantly different than what's reflected in this Report.

However, taking these potential limitations into account, the following set of tables do reflect the most recent official data from the ITU, and data that can be used to compare the situation in Armenia with that of neighboring countries. For purposes of this analysis, Armenia data was compared to that of both neighboring countries (e.g., Azerbaijan, Georgia, Iran, and Turkey), as well as those countries with which it has a historical and/or current economic ties (e.g., Russia and Turkmenistan). In addition, average data is reflected for Low Income Countries as well as Europe, the U.S., and the World, in an effort to provide a regional, income-based, and global comparison of Armenia.

The following tables provide more details of the situation in Armenia. Following each table are key notes clarifying some of the data on the tables, as well as short comments with respect to what one may conclude from the data, regarding Armenia.

[16] World Telecommunications Development Report—1999. Mobile and World Telecommunications Indicators. ITU. Geneva, Switzerland. 10 October 1999.

Telephone Infrastructure - Basic Information

Country	GDP/US$ Per capita	Main Lines Teledensity	Teledensity Largest Cities	Teledensity Rest	95-98 %CAGR	Faults /100
Armenia (L)	429	15.72	20.58	13.07	0.6	20.0
Azerbaijan (L)	517	8.87	18.42	6.09	1.5	75.0
Turkmenstan (L)	943	8.22	15.51	7.11	4.8	46.3
Georgia (L-M)	905	11.55	20.59	8.63	4.1	NA
Iran (L-M)	2,493	11.18	28.56	8.1	10.4	2.6
Russia (L-M)	3,030	19.66	46.53	17.97	5.2	38.4
Turkey (U-M)	3,006	25.41	39.83	23.06	6.3	56.1
Low Income Countries	2,074.73	1.64	5.67	1.09	14.9	145.8
Europe	12,129	37.25	47.98	31.45	3.9	18.0
United States	30,173	66.13	NA	NA	2.9	13.4
World	5,148	14.26	24.99	9.10	5.5	22.2

NOTES:

GDP $ are 1997
Teledensity is lines per 100 inhabitants (1998 data)
95-98 CAGR (Compound Annual Growth Rate) based on Teledensity

Observations: The 1995-1998 CAGR reflected in this table for the most part corresponds to the period in which ArmenTel was partially owned (49 percent by Trans-World Telecom Limited, and the first full year of operations by OTE (90 percent). The data reflects a very flat growth rate of new lines during this period—and while not stated in the table, the ITU Report reflects that there was a waiting list of 110,000 in 1998 (e.g., ArmenTel was only satisfying 83.2 percent of the actual demand for connections). The relative teledensity between urban and rural coverage is relatively good compared to other countries, as is the number of faults per 100 main lines per year.

Basic Telephone Tariffs

Country	Residential (US$)		Business (US$)		Local Calls US$	% GDP per capita
	Connection	Monthly Subscription	Connection	Monthly Subscription		
Armenia (L)	48	1.2	57	0.2	0.12	3.4
Azerbaijan (L)	77	0.8	411	9.3	0.13	1.8
Turkmenstan (L)	31	0.2	385	7.7	NA	0.4
Georgia (L-M)	75	0.7	281	7.2	NA	1.0
Iran (L-M)	578	0.2	578	0.2	0.01	0.1
Russia (L-M)	171	3.4	582	18.8	NA	1.4
Turkey (U-M)	48	4.4	48	4.4	0.08	1.6
Low Income Countries	93	3.9	129	5.2	0.08	19.1
Europe	126	8.0	193	11.2	0.11	1.0
United States	44	19.9	70	41.3	0.09	0.8
World	109	6.9	155	11.1	0.09	7.5

NOTES:

Cost data is 1998; per capita data is 1997

Observations: Interestingly, subscription costs in Armenia are lower for Business users than for Residential. This is typically not the case as it's a near-universal practice to employ price discrimination such that business use cross-subsidizes residential use. Connection fees are on the low side, while actual use is slightly above other countries—but still less than the Low-Income Country average. Nothing here appears to be of any great alarm except that costs relative to GDP (i.e., the percent is considerably higher in Armenia than it is in neighboring countries).

Cellular – Subscribers & Tariffs

Country	Subscribers 1998 (000)	95-98 %CAGR	Teledensity	Connect (US$)	100 Min Basket	% of total subscr
Armenia (L)	7.0	NA	0.20	120	51.30	1.2
Azerbaijan (L)	65.0	121.3	0.85	25	27.50	8.7
Turkmenstan (L)	3.0	NA	0.07	NA	NA	0.8
Georgia (L-M)	60.0	636.8	1.10	105	25.04	8.7
Iran (L-M)	390.0	190.5	0.59	NA	18.04	5.0
Russia (L-M)	747.1	103.6	0.51	135	46.50	2.5
Turkey (U-M)	3,506.1	100.2	5.25	46	47.22	17.1
Low Income Countries	2,348.8	116.6	0.11	91	35.99	6.5
Europe	104,889.7	63.4	13.15	65	40.25	26.1
United States	69,209.3	27.0	25.60	NA	25.00	27.9
World	318,892.9	52.1	5.38	86	38.15	27.5

NOTES: Subscriber data is 1998; Tariff data is 1999
100-Minute Basket is 50 minutes of peak and 50 minutes of non-peak use plus subscription fee, less free minutes

Observations: The introduction of cellular telephony is relatively new in Armenia, with no growth data comparing 1998 with 1995 levels. However, it does appear that the potential growth is not as much as it could be simply due to higher prices—both to connect to the service and also to use the service. It is not uncommon, and in fact is increasingly the case, that due to the speed with which cellular systems can be put into place, that Cellular growth virtually explodes as a substitute for land lines. This data would suggest that this is not the case and likely the higher pricing is at least part of the cause. Other causes for this low adoption of cellular could be slow build out, poor service, and/or inadequate interconnect with landline systems. It is also interesting to note that while GSM is a world-wide Cellular standard that allows for nearly world-wide roaming (except in the U.S.), this feature is not available in Armenia—either by GSM users in other countries coming here to Armenia, or Armenian GSM users traveling to other countries.

International Telephone Traffic

Country	Minutes 1998 (000 minutes)	95-98 %CAGR	Minutes per Inhabitant	Minutes per Subscriber	International Circuits (000) (1998)
Armenia (L)	56.6	2.5	16.0	101.9	0.8
Azerbaijan (L)	64.0	40.7	8.3	94.1	1.0
Turkmenstan (L)	15.3	3.0	3.5	43.2	0.1
Georgia (L-M)	45.7	NA	8.4	72.6	0.3
Iran (L-M)	177.0	-1.2	2.7	24.1	7.9
Russia (L-M)	1,038.2	5.0	7.0	35.8	13.9
Turkey (U-M)	644.1	19.9	9.7	38.0	14.8
Low Income Countries	1,791.6	11.6	0.9	52.5	39.6
Europe	34,051.3	7.0	42.7	115.3	354.4
United States	22,811.9	19.2	85.2	132.3	146.1
World	83,714.6	9.5	14.4	100.7	816.2

NOTES:

Data reflects only outgoing telephone traffic

Observations: Interestingly, while the total amounts aren't significant, the amount of outgoing telephone traffic on a per-inhabitant and per subscriber is considerably higher than neighboring countries and other Low Income countries. This is likely the result of the relatively large Armenian diaspora living outside of Armenia. In that international tariffs from developing countries is typically not cost-based, this likely results in extraordinary profits for ArmenTel for the international calls.

Telecommunications Staff

Country	Telecom Staff		Main Lines/employee	
	1998 (000)	CAGR % 1995-1998	1998 (000)	CAGR % 1995-1998
Armenia (L)	8.4	-3.3	66	1.8
Azerbaijan (L)	12.7	-3.2	54	5.4
Turkmenstan (L)	7.5	-1.2	47	4.7
Georgia (L-M)	9.2	5.9	69	-1.6
Iran (L-M)	47.6	-2.5	154	15.9
Russia (L-M)	444.5	0.2	65	4.9
Turkey (U-M)	72.8	-1.0	233	9.7
Low Income Countries	761.7	1.4	44	15.0
Europe	1,888.6	0.1	157	4.1
United States	1,021.8	4.3	175	-0.5
World	5,433.2	0.6	155	6.2

Observations: Whereas many developing countries find themselves with large, bloated, and ineffective staffs in those privatized Telecommunications entities migrating from a government owned and operated PTT, this does not appear to be an acute issue with ArmenTel. While the number of lines per is substantially higher than the more developed countries, it is actually significantly greater than the average for Low-Income countries. Plus, the number of staff has actually decreased since 1995. With the low faults/100 lines very low (see earlier table), it appears this is not at the expense of quality of service.

Telecommunications Revenue and Investments

Country	Revenue 1998			Investments 1998		
	Total (000 US$)	Per Main Line	Per Employee	Total 1998 (000 US$)	Per Main Line	% of Revenue
Armenia (L)	47.9	86	5,691	16.1	29	33.6
Azerbaijan (L)	79.9	117	6,292	13.5	20	16.9
Turkmenstan (L)	28.4	80	3,774	6.6	19	23.1
Georgia (L-M)	37.4	59	4,086	NA	NA	NA
Iran (L-M)	1,319.3	203	27,663	58.4	9	4.4
Russia (L-M)	3,693.0	127	8,308	1.2	NA	NA
Turkey (U-M)	3,412.7	201	46,849	603.7	36	17.7
Low Income Countries	11,597.50	391	15,296	4,591.4	166	43.8
Europe	221,522.2	746	116,991	47,854.1	163	22.6
United States	246,392.0	1,378	241,135	24,218.1	135	9.8
World	772,548.2	871	133,321	175,655.0	215	24.7

Observations: The revenue per main line and per employee is toward the bottom third of Low Income Countries, but by no means at the bottom of the scale. However it is easy to conclude that there's simply not a lot of revenue to be made by ArmenTel in providing their current services. With respect to making investments, here ArmenTel is at the low end of Low Income Countries on a per line basis (US$ 29/line against US$ 166), but on a percent of revenues basis, is not so low (33.6 percent compared to 43.8 percent for Low Income Countries). The level of investment made in 1998 is on the order of half of what one would expect based on the OTE agreement of $300 million over 10 years (using a straight-line average/year). But in part this may be the result of revenues simply not being sufficient to support a higher level.

Information Technology – Internet & PCs

Country	Internet - 1998				Estimated PCs - 1998	
	Total Hosts	Hosts per 10,000	Users (000)	Users per 10,000	Total (000)	Per 100
Armenia (L)	951	2.69	4.0	11.31	15	0.42
Azerbaijan (L)	435	0.57	0.9	1.24	NA	NA
Turkmenstan (L)	263	0.61	NA	NA	NA	NA
Georgia (L-M)	738	1.36	5.0	9.18	NA	NA
Iran (L-M)	244	0.04	100.0	15.21	2,000	3.19
Russia (L-M)	182,680	12.37	1,000.0	67.71	6,000	4.06
Turkey (U-M)	48,873	7.32	450.0	67.43	1,550	2.32
Low Income Countries	26,309	0.13	775.6	3.90	5,102	0.32
Europe	7,728,825	96.88	39,008.8	488.50	106,528	13.89
United States	30,489,463	1,127.68	60,000.0	2,219.16	124,000	45.36
World	43,486,022	73.43	144,801.0	250.32	337,828	6.43

Observations: Two key numbers with respect to ICTs appear on this table—number of Internet users and number of PCs. Here the numbers are 4,000 Internet users and 15,000 PCs; recognizing that this is 1998 data and this is typically a high-growth sector. For comparison, data collected in interviews (e.g., from ISPs in Armenia) place the number of Internet users at between 60,000-100,000 and the number of PCs at between 25,000-30,000. While there is no way to confirm these numbers, discussions with several individuals appear to reflect these numbers are within reason. For example, all students at the American University have E-mail accounts (approximately 500 students). Also used PCs can be acquired locally for as little as US$ 200-US$ 300.

Network Growth

Country	New Telephone Lines		New Mobile Subsc		New Internet Hosts	
	Total 1997-98	CAGR (%)	Total 1997-98	CAGR (%)	Total 1997-98	CAGR (%)
Armenia (L)	-11.8	-2.1	2.0	40.0	0.5	115.2
Azerbaijan (L)	21.9	3.3	25.0	62.5	0.1	25.4
Turkmenstan (L)	NA	NA	0.5	20.0	0.3	8,666.7
Georgia (L-M)	12.3	2.0	30.0	100.0	0.3	78.7
Iran (L-M)	851.5	13.1	151.0	63.2	NA	20.2
Russia (L-M)	780.8	2.8	219.7	41.7	30.1	19.7
Turkey (U-M)	1,215.5	7.7	1,896.3	117.8	13.8	39.5
Low Income Countries	4,830.3	16.8	801.7	55.9	12.0	91.1
Europe	9,625.1	3.3	43,486.0	71.4	2,049.8	36.2
United States	6,347,5	3.7	13,897.0	25.1	9,865.5	47.8
World	50,558.4	6.4	103,044.0	47.9	13,354.9	44,3

Observations: Here again the data reflects either negative growth of new telephone lines, or low growth with regards to cellular phones (high percent/low base). High growth does show up as to Internet Hosts, but again, while the numbers while encouraging they are off of a relatively small base. The data shows that the current connectivity within Armenia is not very high, nor does the recent growth indicate this is changing to any significant degree.

Year 2000 Projections – Main Lines and Cellular

Country	Main Telephone Lines			Cellular Mobile Subscribers		
	Total (000) 2000	Per 100 1998	Per 100 2000	Total (000) 2000	Per 100 1998	Per100 2000
Armenia (L)	541	15.72	13.53	14	0.20	0.40
Azerbaijan (L)	704	8.87	8.80	150	0.85	1.88
Turkmenstan (L)	382	8.22	7.63	5	0.07	0.10
Georgia (L-M)	688	11.55	12.78	100	1.10	1.86
Iran (L-M)	9,597	11.18	12.80	700	0.59	0.93
Russia (L-M)	31,865	19.66	21.24	1,500	0.51	1.00
Turkey (U-M)	19,986	25.41	29.39	5,000	5.25	7.35
Low Income Countries	48,809	1.64	2.21	8,255	0.11	0.38
Europe	325,397	37.25	40.21	160,149	13.15	19.79
United States	193,006	66.13	69.93	100,000	25.60	36.23
World	1,007,939	14.26	16.45	491,447	5.38	8.17

Observations: Here the ITU reflects projected growth for the period of 1998 (for which they report hard data) to the year 2000, for landlines and Cellular. Interestingly for main lines there is a negative growth being projected, with teledensity in Armenia actually dropping. And while the number of Cellular phones are projected to double from the 1998 numbers, it still is only 14,000 lines—nowhere near the potential for offsetting the decline in landlines.

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Appendix C – Noyan Tapan Interview with Minister Chshmaritian

GOVERNMENT WILL SUPPORT INFORMATION TECHNOLOGIES, SAYS MINISTER KAREN CHSHMARITIAN

YEREVAN, June 5 (Noyan Tapan). Below is an interview with Armenia's Minister of Industry and Trade Karen Chshmaritian, who comments on information technologies and the government's role in this matter:

Noyan Tapan - The process of globalization and the formation of information society open new prospects and simultaneously set new tasks to the countries in transition. What development strategy should Armenia adopt not to be a mere consumer but to be a producer in the information community as well?

Karen Chshmaritian - A new information economy that actively changes the world is being formed as a result of revolutionary progress in the sphere of information technologies. Armenia may be regarded as a country capable of benefiting from the information revolution as far as possible and creating a basis for transition from industrial economy to that based on information technologies. To form information economy, one should create pre-conditions for attracting investments to science and high technology, ensure a high level of Internet service, create a marketing and trade infrastructure requisite for information technologies. Unlike other branches, the sector of information technologies requires transport expenses, introducing expensive sophisticated equipment. Due to information networks flexible productions dispensing with production areas are being set up, comprehensive control over quality is being ensured, the volume of the non-production sphere in the economy is increasing. Pre-conditions for a solution to the problem of creating jobs are being created, which is critical to Armenia.

Armenia may have great prospects in terms of developing information technologies. The studies of the UN Center of International Trade presented in March during a roundtable discussion on the subject of "Market Possibilities of Experts in Information Technologies among Countries with Transitional Economies" organized by the Armenian Development Agency and the Ministry of Industry and Trade is another testimony to this.

The position of the Armenian Government on this issue is unequivocal - the sector is a priority and has a strategic importance, state support is rendered to programs being implemented in this direction. Such issues as computer equipment, information infrastructure, personnel training and others must be included in the program. The Ministry of Industry will be developing, implementing and coordinating the state policies of the Republic of Armenia in the field of developing the sector of information technologies.

NT - What is the situation in Armenia's industry of information technologies?

K.Ch. - In the sector of information technologies of Armenia there are about 10 foreign organizations and over 40 domestic companies engaged in efforts on programming in local and global networks, assembly and introduction of computer equipment.

NT - Armenia is in leading positions in the region from the viewpoint of its information technologies, however the productive capacities and infrastructure of information technologies require upgrading. What is needed to attract large international corporations to Armenia?

K.Ch. - The industry of information technologies of Armenia was a leading one among the republics of the former USSR due to inventions by specialists from the Yerevan Scientific-Research Institute of Machines in the 1960s-70s, the activities of the "Hrazdan" and "Nairi" computer complexes. Happily, the republic has retained its intellectual potential.

Considering this circumstance, the Ministry is working out a program of developing information technologies in Armenia attaching great importance to the creation of Technoparks. The method of creating technoparks was applied in a number of countries which are currently a high profile in the sphere of information technologies (India, Malaysia).

NT - The lack of large international corporations on the Armenian market and the high cost of finance greatly complicate the flow of investments to the sphere of information technologies. What is the significance of the creation of the Fund of Venture Capitals and a Leasing Company in Armenia in this sense?

K.Ch. - The reasons mentioned by you play a definite role in attracting investments to the sphere of information technologies, but no greater role than in other spheres. The problem concerns not only the sphere of information technologies and the problem is not only in the absence of international corporations here in Armenia. It is important to create a generally favorable investment climate in Armenia.

The establishment of a Fund of Venture Capital may play an important role in developing the sphere of information technologies in the country. Currently, the International Financial Corporation of the World Bank is studying the possibilities of creating such a fund, as well as a Leasing Company.

NT - The lack of skills of market examination in the new global environment, the maladjustment of the education system to the present-day requirements - all these problems also complicate the attraction of investments. What is being done to overcome these obstacles?

K.Ch. - In fact, the question can be divided into two parts: first, specialists of the sector do possess certain experience of work and skills. Re-training courses will be organized for them. This willingness was expressed by the CEMA Center of the French JIIA company, Armenian organizations ITE and ITF, as well as the Canadian Center of Trade Support CESO.

Annually, 300 specialists in information technologies graduate from the department of applied mathematics of Yerevan State University and four faculties of the Armenian State Engineering University. Nevertheless, the level of academic education does not meet the requirements of the rapidly developing and constantly changing market. The US Embassy in Armenia and the American University of Armenia with the financial assistance of the International Center of Science and Technology of the US Government recently initiated a $100,000 program of training specialists in web-design and programming.

The problem of adjusting the education system to the modern requirements is also connected with the possibility of expanding the local market. Society must be capable of using information technologies with maximum effect. One should start seeking a solution to this problem from schools providing general education. It is necessary that the Ministry of Education and Science develop long-term programs; we will provide material support and attract highly skilled specialists. The development of computer programs in the Armenian language is of great importance, as it will facilitate the process of teaching information technologies to school-children and students.

NT - ArmenTel's monopoly retards the conversion of the Internet and computers into an instrument available to broad sections of the population. What changes should be made in legislation?

K.Ch. - Of course, ArmenTel's monopoly retards the spread of the Network in Armenia, but this problem will be solved spontaneously through creating technoparks, and the solution will not hinge on the presence of ArmenTel's monopoly. Problems emerge in the issue of protecting intellectual property, it is necessary to make changes in relevant laws as well as in the order of their application. Besides developing the domestic legislation in the sphere of information technologies, it is necessary to adjust it to the international legislation and the requirements of the Agreement on Information Technologies of the World Trade Organization.

NT - What should be the role of the state and private sectors in developing the sector of information technologies?

K.Ch. - The role of the state mainly consists in the selection of priorities, adopting normative acts and relevant laws supposed to create favorable conditions for developing information technologies. The best option of developing the sector is through creating a Technopark, a special economic zone where equal conditions are provided for companies engaged in information technologies regardless of the type of property and their legal status.

The public sector will be given the role of a consumer promoting the development of information technologies and setting new emergent requirements.

NT - What role can the Armenian Diaspora play in developing information technologies in Armenia?

K.Ch. - Armenia's sector of information technologies with a high level of development, relatively low self-cost and almost independent on transport and other barriers is attractive for investments (including Diaspora investments and has a low degree of risk). Besides, the Diaspora may promote the development of information technologies in Armenia by way of using the possibilities of foreign markets and establishing business links.

I think it is important to emphasize the fact that the Government of Armenia and specialists are positive that it is necessary to develop the sector of information technologies, and they are ready to render every assistance in this matter, which may become a crucial factor for the successful realization of the scheduled programs.

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The original plans for this ICT Assessment included within the Team, an attorney from the U.S., in order to address the E-Commerce legal issues here in Armenia. However, due to last minute problems with the team member regarding Visa's and reentry to the U.S. The ICT Assessment Team had to cancel the travel—with insufficient time to pull in someone for the assignment. As a result, SETA Corporation secured the services of a local firm for addressing these issues, with the following being the Executive Summary extracted from their final report. The content is reflected in the E-Commerce portion under the Public Sector section of this report.

Executive Summary

The International Legal Consulting (the "ILC"), at the request of SETA Corporation, has conducted a review of the general legal environment in Armenia, in an effort to assess whether the requisite conditions exist to support the introduction of E-Commerce. Specifically, ILC was tasked with the review of the following areas:

1. Intellectual Property Rights;
2. Armenia's adherence to multilateral organizations' agreements;
3. Legislative framework dealing with electronic signatures, encryption, security and privacy; and
4. Identification of customs and accounting procedures which may pose obstacles to the development of E-Commerce.

Throughout the preparation of this report, the ILC worked closely with Mr. Rouben Kalashyan, an expert in the field of Intellectual Property Rights ("IPR"). Various other interviews were conducted with government representatives and departments, including the Ministry of Industry and Trade and the Ministry of State Revenues.

It is apparent that, although Armenia is making strides in the legislative sector, it is not fully prepared to absorb the rapid global development of information technology and electronic commerce. Many obstacles, such as lack of requisite legislation, as well as notable lack of transparency in procedures and regulations dealing with export and import, present barriers to Armenia's entry in to the global electronic market.

This report incorporates several recommendations which address a the obstacles surfaced during the assessment.

U.S. – Armenia Business and Investment Association – USABIA
Council of High Tech Executives and Entrepreneurs

High Technology and Economic Development in Armenia
A Government Policy Briefing Paper

The Council of High Tech Executives and Entrepreneurs (Council) has been recently formed under the USABIA to harness the power of the Diaspora and to dramatically enhance economic development in Armenia. The Council's initial focus has been to create a network of executives and entrepreneurs in the Diaspora who have the ability to invest, promote entrepreneurial activity, and stimulate employment in the software development, information technology and electronic commerce industries in Armenia.

To date, more than 25 high tech executives from throughout the U.S. have participated in Council meetings in Boston, San Francisco and Washington, DC. Additional sessions are planned for New York and also in Armenia in the months ahead. Participants includes senior executives of several companies already employing a significant number of software developers in Armenia, as well as others that are interested in employing additional programmers if conditions improve in Armenia.

Council members have reviewed studies on the IT and software industries in Armenia, which identify some 15 local software firms currently employing hundreds of skilled programmers. While a number of other programmers in Armenia are employed by companies headquartered overseas, a large number of software engineers have left the country to find more lucrative employment opportunities outside Armenia. Members have also studied the successful models for industry and economic development in other developing countries, including India, Poland, Malaysia, Philippines and Bangladesh.

We believe that these high technology industries will grow exponentially in the next decade, and that Armenia can gain a regional comparative advantage through a number of private sector and government initiatives. In the course of our work, Council members are planning to take the following actions:

- Establish and improve the technical training and certification programs needed to increase the skilled labor pool in software development and high technology, in cooperation with Armenian colleges and universities.

- Augment the managerial, marketing and technical sophistication needed to make the IT sector in Armenia competitive globally through exchange, internships, and advanced training programs.

- Form a new Diaspora-based, common management and marketing organization to expand distribution channels, reduce the risk and increase export sales of outsourced software development for existing software development companies in Armenia.

- Assist in the creation of a Master Plan that defines specific objectives, funding requirements, roles and responsibilities of key players in the public and private sectors, and sets forth a timeline for the development of a competitive IT sector in Armenia.

- Treat Armenia as a start-up environment, where initial seed money, venture capital funds and direct foreign equity and capital can be invested as required to incubate new businesses based on lessons learned and best practices in the global IT industry.

- Promote employee stock ownership and other incentive programs to reward exceptional performance, strengthen ties between employees and employers, and reverse the trend of skilled software engineers and developers leaving the country.

- Assist in the creation of an Information Technology and Electronic Commerce (ITEC) Park to provide the necessary facilities, infrastructure and equipment to support the incubation and rapid expansion of software development, electronic commerce, Internet and other high technology companies in Armenia.

- Expand and formalize the membership of the Council in the U.S. and internationally, and establish relationships with relevant software and computer industry associations in Armenia to enhance their effectiveness.

- Create a jigsaw of horizontal distribution channels and vertically integrated businesses including web portals, e-commerce, telecom and wireless web technology companies in western markets all working synergistically where Armenian software companies can serve as a source of low cost labor and productivity.

Government Policy and Regulatory Initiatives to Promote Technology Development

The Council believes the U.S. Government, Armenian Government, World Bank, and other International Financial Institutions have key roles to play in order to create an attractive climate for high technology investment, employment and economic development in Armenia.

We propose that the Armenian Government take certain actions in the near term, in such diverse areas as intellectual property law, tax incentives, import duties, labor law, custom bonding and export certification policies. Specifically, the Council respectfully requests that the Armenian

Government give consideration to the following actions to promote economic development in the software and information technology sectors:

1. Pass and enforce intellectual property rights laws, particularly in terms of copyrights and trade secrets.

2. Adopt more competitive taxation policies to reduce the income tax rates for software developers and corporate taxes for all IT sector employers.

3. Reduce indirect taxes on all IT related products to ensure that Armenian companies are not disadvantaged.

4. Streamline customs clearance procedures for IT hardware and equipment imports.

5. Amend restrictive provisions of labor laws and constraints on employee stock ownership.

6. Encourage foreign direct and venture capital investment in the software and IT services sector through laws that provide protection of minority shareholder rights.

7. Adopt telecommunications policies and regulations to promote widespread Internet access throughout the residential, educational and commercial sectors of Armenia, and the availability of affordable high speed Internet access for software companies.

8. Develop and adopt legislation to promote the growth of Internet-based electronic commerce, and financial transactions within Armenia and with the Diaspora.

9. Consider the development of various electronic government and IT programs that could leverage foreign aid and provide funding for local software development firms.

10. Provide government support for various initiatives, including creation of an ITEC Park, high tech incubators, software training and technical certification centers, and the establishment of a free economic zone for the IT sector.

Selected Participants in Council Meetings through June 2000

- Razmig Abnous, Vice President of Technology, Documentum
- Serge Adamian, President, SolarEn International
- Noubar Afeyan, President/CEO, NewcoGen Group
- Shawn Aghababian, VP Operations, Distribution Dynamics
- Dork Alahydoian, Manager, Strategic Planning, LookSmart
- Garo Armen, President, Antigenics
- Berge Ayvazian, President/CEO, the Yankee Group

- Anthony Barsamian, Attorney
- Richard Bezjian, President, Boomerang Software
- Brian Bogosian, President and CEO, Visto Corporation
- Sonia Medzadourian Crow, Executive Director, U.S.-Armenia Business and Investment Association
- Armen Der Kiureghian, Dean of Engineering, American University of Armenia
- Raffi Festekjian, President, PCi Services, Inc.
- Ashot Hovanesian, President, Synergy International Systems
- Rick Moradian, Senior VP, Operations, E-Translate, Inc.
- Robert Petrossian, CEO, Minerva
- Sam Simonian, Chairman, INET Technologies
- Roger Strauch, Chairman, Ask Jeeves
- Alex Tajarian, President, DomainMart
- John Waters, Secretary/Treasurer, Cafesjian Family Foundation

June 23, 2000